Bulletin of the British Ornithologists' Club

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March 2007

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MEETINGS are normally held in the **Sherfield Building** of **Imperial College**, South Kensington, London SW7. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges were increased to **£22.50** per person as from **1 January 2007.**

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

24 April 2007—Annual General Meeting at 6:00 pm, followed by **Club Social Evening**. There will be no booked speaker, but members are invited to bring along one or two slides, a short PowerPoint presentation or a specimen (!) of a bird or ornithological subject of topical interest, and to speak **for not more than 5–10 minutes** about it. The aim will be to generate discussion and to facilitate the exchange of information between members.

Applications to. Hon. Secretary (address below) by ***10 April***

10 July—Prof. C. M. Perrins—*Swan upping*

25 September—Lord Cranbrook—*Swiftlets*

6 November—David Fisher—*Birds of Australia*

Please note that only six meetings are scheduled for 2007

Overseas Members visiting Britain are especially welcome at these meetings, and the *Hon. Secretary* would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876 995 (or e-mail: boc.sec@bou.org.uk).

Bulletin of the BRITISH ORNITHOLOGISTS' CLUB

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CLUB ANNOUNCEMENTS

Committee is currently reviewing options for the future direction of the Club and the Bulletin, in pursuit of the Club's charitable objectives, namely: 'the promotion of scientific discussion between members of the British Ornithologists' Union and others interested in ornithology, and to facilitate the dissemination of scientific information concerned with ornithology with a particular emphasis on avian systematics, taxonomy and distribution'. **We are considering the future of the dinner meetings and whether there might be more interest in occasional day or half-day meetings or visits**. A questionnaire is enclosed and we would be very grateful if you could spend a few moments to complete it. A copy can be submitted electronically via the BOC website: www.boc-online.org

Members are reminded that annual subscriptions for 2007 were due on 1 January at the revised rate of £20, regardless of whether members are also members of the BOU. Members are also respectfully reminded that dinner meeting charges increased to £22.50 per head from 1 January 2007.

ANNUAL GENERAL MEETING

The Annual General Meeting of the British Ornithologists' Club will be held in the Sherfield Building, Imperial College, London SW7 at 6.00 pm on Tuesday 24 April 2007.

AGENDA

1. Minutes of the 2006 Annual General Meeting (see *Bull. Brit. Orn. Cl.* 126: 83–85).
2. Chairman's report.
3. Trustees Annual Report and Accounts for 2006 (both to be distributed at the meeting).
4. The *Bulletin*. Editor's report—G. M. Kirwan.
5. Publications report—Revd. T. W. Gladwin, Chairman JPC.
6. The election of Officers. The Committee proposes that:
   (i) Mr S. A. H. Statham be re-elected as *Hon. Secretary*.
   (ii) Mr D. J. Montier be re-elected as *Hon. Treasurer*.
   (iii) Two appointments to committee to be made (*vice* I. R. Bishop OBE and C. W. R. Storey) from the following nominations: Dr R. P. Prŷs-Jones and D. J. Fisher. No other changes to the committee are proposed, as all other members are eligible to serve at least one more year in office.
   Ex-officio members (in continuation): Revd. T. W. Gladwin (*Chairman Joint Publications Committee*), Prof. R. A. Cheke (*Hon. Publications Officer*), S. P. Dudley (*Hon. Website Manager*) and G. M. Kirwan (*Hon. Editor*).
7. Any other business, of which advance notice has been given.

The 937th meeting of the Club was held on Tuesday 26 September 2006, in the Sherfield Building Annexe, Imperial College, London. Nineteen members and seven guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, Sir D. G. BANNERMAN, Dr A. P. BUCKLE (*Speaker*), D. R. CALDER, Dr J. COOPER, Dr R. A. F. COX, Prof. C. J. FEARE (*Speaker*), J. B. FISHER, F. M. GAUNTLETT, D. GRIFFIN, Dr J. P. HUME, R. H. KETTLE, D. J. MONTIER, Mrs M. N. MULLER, R. J. PRYTHERCH, S. A. H. STATHAM, C. W. R. STOREY and P. J. WILKINSON.

Guests attending were: Lady M. P. BANNERMAN, Mrs C. R. CASEMENT, Mrs M. H. GAUNTLETT, Mr C. MULLER, Dr C. PRESCOTT, Dr B. M. ROGERS, and Dr L. STEEL.

After dinner, Prof. Chris Feare provided a timely talk on *Avian influenza: the disease and its conservation implications*. The highly pathogenic avian influenza (HPAI) virus of the subtype H5N1 has been responsible for huge economic losses, through poultry deaths, culls and curtailment of international trade, and some human infections, over 50% of which have proved fatal. It has also raised conservation concerns because of deaths of wild birds and as a result of some attempts to deter wild birds through culling, habitat destruction and scaring. The virus circulated widely in south-east Asia for several years in poultry before being found in wild birds. However, wild birds, especially waterbirds, are the natural hosts of low pathogenic avian influenza viruses, which produce no ill effects in birds. This led to suspicions that wild birds could spread H5N1 and these were reinforced when wild migrant waterbirds died in large numbers at Lake Qinghai, north-west China, in 2005. Later in 2005, the virus was found in poultry and wild birds in southern Siberia. This occurred towards the end of moult, during which waterbirds become flightless; it did not follow a known migration route or occur at a time of seasonal migration, but reported outbreaks were along trade routes. Subsequently, outbreaks occurred in the Black and Caspian Sea areas, which are on known migration routes from Siberia, and during migration, but the evidence that migrant birds were responsible for transmitting the virus is only circumstantial. In spring 2006, however, a well-publicised spread west through Europe did show that wild birds could carry the virus over international boundaries. These birds appeared to have been dispersing from freezing conditions in eastern Europe/western Asia; they were not on long-distance seasonal migration. The key requirement for migrants to transmit the virus over long distances is that they can become infected but remain healthy. Whilst asymptomatic infection has been reported in captive waterfowl, reports of such infection in free-living wild birds in the scientific literature are unconvincing. More research is needed to demonstrate the ability of wild birds to undertake migration, during which immunocompetence may be impaired, when infected with what is commonly a lethal virus. At present, movements of infected poultry and poultry products are implicated in both short- and long-distance spread of the disease.

In a second talk, Dr Alan Buckle provided an overview of conservation measures on Great Salvage Island and the current status of Cory's Shearwater *Calonectris diomedea*.

The 940th meeting of the Club was held on Tuesday 7 November 2006, in the Sherfield Building Annexe, Imperial College, London. Eighteen members and three guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, D. R. CALDER, N. CLEERE, E. C. DICKINSON (*Speaker*), D. J. FISHER, J. B. FISHER, A. GIBBS, D. GRIFFIN, M. C. JENNINGS, R. H. KETTLE, R. R. LANGLEY, Dr C. F. MANN, D. J. MONTIER, Mrs M. N. MULLER, P. J. SELLAR, S. A. H. STATHAM and P. J. WILKINSON.

Guests attending were: J. M. GREEN, Mrs M. MONTIER and Dr A. POLASZEK

After dinner, Edward Dickinson offered a layman's view of *Avian nomenclature and the ICZN code*. Mentioning Captain C. H. B. Grant, a distinguished past Vice-Chairman and Editor of the *Bulletin*, as one who had published forthright views on nomenclature, he said that Grant would be dismayed to perceive how great had been the drift away from the primacy of the Principle of Priority in favour of stability. That stability been given attention was correct. Dredging up older names that might replace young ones that had been in unchallenged use for generations was unproductive and harmful to clear communication between scientists. However, the pendulum has perhaps swung too far and this is possibly most evident in the attempt to assert validity based on 'prevailing usage'. Stability is important, but prevailing usage as written into the Code actually defeats stability. Instability is also overstated, most change in names is due to transfer between genera, and as molecular evidence accumulates we should expect more change and probably anticipate that generic names in synonymy will re-emerge. Priority depends on reliable dating; whilst the Code goes a long way to help with this, the French text is much more explicit than the English and requires proof where the English version just speaks ineffectually of 'evidence'. Sadly, 1990 was the last year that the title pages issued for *Ibis* included complete dates of publication for each of the four issues. At least the Club's *Bulletin* continues to recognise the need to provide complete dates on each issue. Following the description of *Laniarius liberatus* in 1991, a debate began on naming avian taxa without complete bird specimens (see Banks *et al.*, 1993, *Auk* 110: 413–414), and after the naming of *Caprimulgus solala* (Safford *et al.*, 1995, *Ibis* 137: 301–307) this resurfaced (Collar, 1999, *Ibis* 141:

358–367; 2000, *Bird Conserv. Intern.* 10: 1–15) and in 2006 the naming of *Liocichla bugunorum* in *Indian Birds* based on photographs and feathers, from which DNA is to be extracted, again raised the issue. The Code needs further thought and perhaps greater clarity; in particular, undescribed birds known to have tiny populations need to be named, as leaving them unnamed is not an option and collecting them would cause collecting, which in general must be sustained, to come into disrepute. The Code now needs to consider whether and how to validate names proposed in electronic publications and plans to do this through mandatory registration and the Zoobank initiative. Dr Andrew Polaszek, Executive Secretary of the International Commission for Zoological Nomenclature, explained what was planned.

The 941st meeting of the Club was held on Tuesday 5 December 2006, in the Sherfield Building Annexe, Imperial College, London. Twenty-one members and eight guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, Mrs D. M. BRADLEY, Ms D. V. BREESE, Dr A. BUCKLE, Dr R. A. F. COX, D. J. FISHER, J. B. FISHER, F. M. GAUNTLETT, A. GIBBS, Prof. J. J. D. GREENWOOD (*Speaker*), D. GRIFFIN, R. R. LANGLEY, D. J. MONTIER, P. J. OLIVER, Dr R. P. PRŶS-JONES, P. J. SELLAR, S. A. H. STATHAM, C. W. R. STOREY, Cdr. F. S. WARD, RN, and P. J. WILKINSON.

Guests attending were: Dr C. BOWLT, Mrs E. BOWLT, M. BRADLEY, D. BRADLEY, Mrs B. FISHER, Mrs M. H. GAUNTLETT, Mrs B. HAMMOND GIBBS and Mrs M. MONTIER.

After dinner, Prof. Greenwood, Director of the BTO, outlined the complex relationships for *The future of birds and Man*. Max Nicholson believed in rational planning based on evidence; he founded the BTO to provide information about birds. Human activities have caused many bird populations to decline, especially on farmland, but we know enough, in principle, to reverse these declines. Mankind has even greater impacts than this on the world's ecology, climate change being the best known. Greater impacts are inevitable but we can fix the problem by a determination to use energy more efficiently and to use sustainable sources, though the US government continues to drag its feet. *Homo sapiens* now uses *c.*50% of the resources available on Earth and humanity is now consuming about one-third more than is sustainable, eating into the Earth's natural capital rather than merely living off the annual production. Our dependence on the rest of nature is worth about twice as much, in economic terms, than our own global GDP. Fortunately, population may stabilise during this century but there are still huge problems of poverty to be tackled, which will make living within sustainable limits difficult. British politicians and businessmen see both the need to tackle these issues and the economic opportunities for doing so. This can only be done by steering a course between Marxist command economics and unrestricted free markets, both of which have proved incapable of delivering the best outcomes. There are big uncertainties, especially in how Russia, China and the USA will tackle these issues. Enlightenment values of using rational argument and sound evidence appear to have been cast aside in the 20th century, but Max Nicholson was still militantly optimistic in his tenth decade; and he was right to be so.

C. A. R. (Christopher) Helm (1937–2007)

It is deep regret that we report the death, on 20 January, of Christopher Helm (member 1989–2007). Most of us will remember him chiefly for the numerous bird books he published, bearing his name on their spines, and these will remain his lasting legacy. His name first came to my notice with the publication in 1983 of Peter Harrison's *Seabirds: an identification guide*, a book that transformed the study of birdwatching for seafarers and owes much to the pioneer work of Captain G. S. (Gerald) Tuck, DSO RN, my predecessor as Chairman of the Royal Naval Birdwatching Society and editor of *Sea Swallow*. Publication of Peter Harrison's book led to much correspondence with the author, and subsequently to my meeting Christopher in the early 1990s at BOU, BTO and BOC gatherings, where he was always the 'life and soul' of any party. Much has already been published, at greater length, about Christopher's remarkable achievements for ornithology, in the national press and doubtless other birding journals. But I count Christopher as a true and loyal personal friend, and a strong supporter of BOC. Until very recently he regularly attended BOC dinner meetings, where he enlivened proceedings with his generous hospitality and great charm. He will be greatly missed by all Club members.

Michael Casement

Integrative systematics at the species level: plumage, songs and molecular phylogeny of quailfinches *Ortygospiza*

by Robert B. Payne & Michael D. Sorenson

Received 20 February 2006

Species delimitations in birds generally are readily discerned and find a consensus among ornithologists, and this happy circumstance follows from the mutually consistent evidence that is typically derived from application of different species concepts to the same set of birds. First, under a 'biological species concept', populations that share unique behaviours and interbreed where their ranges meet are considered the same species. Breeding in sympatry without interbreeding provides evidence of reproductive isolation of two populations and thus of species, whereas the occurrence of birds of intermediate morphology suggests recent or current gene flow and indicates a single species is involved (Mayr 1963, 2000, de Queiroz 2005). Second, a 'phylogenetic species concept' uses the presence of exclusive sets of characters of birds (Cracraft 1983, Sites & Marshall 2004). Operationally, under this concept species have been recognised based on morphological characters, much as in Linnaeus (1758), without any phylogenetic analysis having been performed (Wheeler & Platnick 2000). Finally, molecular data have been analysed in a phylogenetic perspective, with the ideal of genetically exclusive lineages as a criterion for recognising species; that is, the historical isolation and independent evolution of populations, in the current version of a lineage or 'evolutionary species concept'. We now know, however, that gene trees do not always coincide with species trees, owing to incomplete lineage sorting of genes (de Queiroz 1998, 2005, Arbogast *et al.* 2002, Avise 2004), and species can be delimited without reciprocally monophyletic gene trees (Knowles & Carstens in press).

An 'integrative species concept' combines these views of species in the past and present. A complementation of independent lines of evidence is very important for diagnosing biological species. We consider both the geographical patterns of morphological differences between populations and the phylogeny of genetic lineages. In addition to morphological variation and genetic lineages, we note that songs are important to the birds: experimental evidence points to songs as a major behavioural cue in mate recognition by breeding females (Searcy & Yasukawa 1996, Payne *et al.* 2000, Sorenson *et al.* 2003). In consequence we interpret song differences between morphologically recognised taxa as evidence that more than one species may be present, and the lack of song differences as an argument that populations are conspecific (e.g. Alström & Ranft 2003). In addition, an integrative species concept offers a response to claims that species are best recognised simply in terms of genetic distances between populations, insofar as rates of genetic divergence differ between lineages, and as gene trees may coalesce only after a

speciation event (Moritz & Cicero 2004, Dayrat 2005, Will *et al.* 2005). Integrative systematics proposes that taxa should be compared within an estimated phylogeny, rather than simply in character lists of taxa. The integration recognises that genetic sequence data viewed in a phylogeny is part of a comprehensive view in which geographic variation, morphology and behaviour provide equally useful information at the species level.

African quailfinch *Ortygospiza* are small terrestrial finches that occur in short-grass and seasonally flooded riverine plains of open country in sub-Saharan Africa. They are inconspicuous, staying on the ground, then rising on whirring wings and with rattling flight-calls. Adults are sexually dimorphic in plumage, and they vary in bill and plumage colour and the intensity of plumage markings, especially in males. As evidenced by plumage and by molecular data, *Ortygospiza* are most closely related to the African estrildid genera *Amadina*, *Amandava* and perhaps *Paludipasser* (Sorenson & Payne *in* Fry 2004, Sorenson *et al.* 2004). The number of quailfinch species has been less certain. Here we describe the adult plumage and bill colour of quailfinch taxa, and the evidence of breeding sympatry. We compare songs and nestling mouth colours and patterns to evaluate any behavioural differences between populations, both as traits that may be important in successful reproduction and as markers of gene flow. Finally, we use molecular genetics to determine the phylogenetic relationships among geographic populations across Africa. We consider these criteria together to assess whether previously described taxa represent species. Using these criteria we reason that quailfinch are best recognised as a single species, *Ortygospiza atricollis*.

Systematic history and plumage variation in *Ortygospiza*

Based on geographic variation in plumage, previous authors have recognised one, two or three quailfinch species. Sclater (1930a) and Chapin (1954) recognised a single species, and Wolters (1975, 1985) recognised one species with three groups: a west African 'black-faced quailfinch' *O. atricollis* (Vieillot, 1817), a central African 'black-chinned quailfinch' *O. gabonensis* Lynes, 1914, and an eastern and southern 'African quailfinch' *O. fuscocrissa* Heuglin, 1863. More recently, Fry (2004) recognised these 'racial groups' as three species and reported areas of geographic overlap between them.

Most earlier and some recent accounts recognised two quailfinch species, with the taxa combined in different ways. Over much of Africa, white-chinned quailfinch, described from Senegal (*O. atricollis*), have some white around the eye, whereas black-chinned birds (*O. gabonensis*) lack this. Immelmann *et al.* (1965, 1977a), Mayr *et al.* (1968), Benson *et al.* (1971), Goodwin (1982) and Dickinson (2003) recognised these as two species. In another representation of two species, Sharpe (1890) and Shelley (1905) recognised one species with white on the throat and around the eye, '*O. polyzona*' (Temminck, 1823), and a second species without white except 'a few whitish plumelets round the eye', *O. atricollis*. In a third model, White (1963) recognised *O. fuscocrissa* for the distinctly spectacled forms of

eastern and southern Africa, and *O. atricollis* for the west African birds and the black-chinned birds from central Africa.

Differences in delimiting quailfinch species stem from inaccuracies in plumage descriptions, puzzling original descriptions, and questionable records of breeding sympatry of populations. First, the quailfinch with white around the eye have an incomplete eye-ring, the posterior part of the ring is variably complete and the anterior ends of the broken ring extend from the eye to the bill as white lines above and below the lores (which vary from grey to black). These white markings are most prominent in birds from east and southern Africa, which have a distinctive spectacled appearance, more so than birds in west Africa. Descriptions of black- and white-chinned quailfinch in Sharpe (1890) overlooked the presence of a small white chin patch in the western birds. Vieillot (1817) described the small white chin patch in his species *Fringilla atricollis* from Senegal, as mentioned also by Cassin (1860). Confusion more importantly traces to Temminck's description of *Fringilla polyzona* with two specimens, a female and a male, apparently from two geographic sources. (Temminck, 1823: col. 221, fig. 3) illustrated a pale female, and his text described a female with the chin white and the underparts pale with the dark bars on the flanks broadly separated by the belly. Temminck's text description of a male, however, was of a dark bird with a black throat. Sclater (1930a) recognised one species of quailfinch, *O. atricollis*, with seven subspecies, one being *O. a. polyzona* (Temminck, 1823) which Sclater (1930a: 784) recognised as being like the pale birds in South Africa; his footnote remarked that Temminck's description of the male involved the Gambian form. Temminck reported the birds as from 'les provinces de royaume de Gambie sur les côte d'occidentales d'Afrique'. His illustration depicts a female with a white streak above the eye; syntype RMNH 90327 has the face nearly all white and unfeathered, apparently due to feather loss post-collection and to application of a white substance, perhaps a preservative (for museum acronyms see Acknowledgements). No other syntypes of *polyzona* have been traced; either in RMNH or in MNHN (RBP; J.-F. Voisin *in litt.* 2006). Roberts (1930) declared *polyzona* to be a synonym of *O. a. atricollis*, on the grounds that the description of the male must have priority. Grant & Mackworth-Praed (1956) concurred and emphasised that Vieillot designated the birds as being from The Gambia, making *O. polyzona* (Temminck, 1823) a synonym of *O. atricollis* (Vieillot, 1817), and recent accounts have followed this reasoning (e.g., Mayr *et al.* 1968). Temminck's illustration resembles both the female syntype of *polyzona* (incorrectly labeled as from Senegal), and a female quailfinch (UMMZ 211483) from the Save River near Beira, southern Mozambique.

In the dark-plumaged quailfinches, *O. gabonensis* Lynes, 1914, was described from Gabon and diagnosed by the back-feathers being streaked (not uniform), the absence of white on the chin and around the eye, and the white bars of the underparts being broader than in other quailfinch (the 'female' in his description was a juvenile: Cowles 1957). Lynes subsequently collected another new quailfinch at Kawambwa, north-east Zambia, *O. a. fuscata* Sclater, 1930, the plumage nearly

black above, dark cinnamon on the belly and narrower white bars on the underparts than the most similar form, the dark-plumaged, black-faced *O. a. ansorgei*. *O. a. fuscata* had the bill orange with sepia on the tip and around the nostrils (Sclater 1930b). Sclater (1930a) recognised *gabonensis* as a subspecies of *O. atricollis*, as did Bannerman (1949). The other black-chinned taxon was *O. a. dorsostriata*, described by van Someren (1921a) from western Uganda as being like *gabonensis*, but 'richer rufous on the breast; moreover, the male has a small white chin-spot, the female not. There is no white ring round the eye.' These dark-plumaged quailfinch occur in central Africa, mainly at the fringes of the rainforest zone.

In the quailfinches with little white on the face and chin, other taxa have been described in addition to nominate *O. a. atricollis*. *O. a. ansorgei* Ogilvie-Grant, 1910, from Guinea-Bissau, was described on the basis of the black chin and throat extending onto the chestnut breast, the white bars below fewer, the upperparts darker; one of two males had a small white patch on the chin, and in both specimens of the type series the bill was dark red-brown above and crimson-lake below. *O. a. ansorgei* in The Gambia, Guinea-Bissau, Guinea, Sierra Leone to Liberia and Côte d'Ivoire in the far west, have a small white line on the chin (sometimes lacking; Gatter 1997: 280 in Liberia; MCZ 153629 from Guinea-Bissau), and a black face with little or no white around the eye and lores. Elsewhere in west Africa, from Senegal and Mali to Nigeria and Cameroon, *O. a. atricollis* has white feathers above and below the eye and lores. Although colour plates in regional field guides and other works illustrate west African birds as lacking white around the eye and lores (Serle & Morel 1977, Clement 1993, Barlow & Wacher 1997, Borrow & Demey 2001, Fry 2004), and Bates (1930) mentioned no white around the eye and lores, nominate *O. atricollis* does have some white in these areas, but this is not obvious in poorly prepared specimens. In Nigeria, eight of ten males photographed by RBP at Bukuru, Nigeria, in September–October 1995, had a few white feathers below the eye and on the lores (Fig. 1); five of six adult females also had some white in these areas (mainly on the lower branch of the lores) and a partial ring below the eye. These 'white-chinned' *ansorgei* and *atricollis* are otherwise dark, more like *fuscata* in northern Zambia than the paler quailfinch of east and southern Africa.

O. a. ugandae van Someren, 1921, in Uganda and the North Kavirondo region of western Kenya, was described as similar to *O. a. ansorgei* but uniformly grey-brown above. Later, van Someren (1922) noted *ugandae* to have 'uniform grey-brown mantles, black foreheads, extensive black throats, and small white chin-spots, with a white ring round the eyes; breasts pale brownish'; and *dorsostriata* to be like *gabonensis* but 'richer rufous below and the flanks darker. The female has no white chin-spot. The male has a small indication of white on the chin, but no white round the eye.' Birds in Uganda and Sudan are intermediate between *O. a. atricollis* and *O. a. muelleri* (*ugandae* are darker chestnut below than *muelleri*); Sudan birds (SMNS series) have more white on the face than *O. a. atricollis*, in contrast to the evaluation by Nikolaus (1987). In fact, the plumage of *ugandae* is barely separable from the plumage of *muelleri* except for the narrower white eye-

Figure 1. Plumage variation in west African quailfinch. All are males, except f = female. (a–f) Jos, Nigeria, October–November 1995 (a, -/y; b, UMMZ 233845; c, -/o; d, UMMZ 233846; e, -/r; f, -/G); (g) captive UMMZ 232576 (the specimen in Groth 1998); (h) Marakissa, The Gambia, September 1996; (i) Ngaoundere, Cameroon, male taken with four fledglings, UMMZ 232472.

ring in *ugandae*, though the white eye-ring is distinct in the holotype, FMNH 257709, taken near *O. a. muelleri* in southern Kenya. The dry woodland and steppe region of sub-Saharan Africa between Senegal and Sudan and into northern Uganda and western Kenya is a nearly continuous vegetation zone (Keay 1959, Moreau 1966). This region is separated by drier country from other vegetation zones where quailfinch occur, and we refer to the region where *atricollis*, *ansorgei* and *ugandae* occur as west Africa.

O. a. fuscocrissa Heuglin, 1863, in Ethiopia, north-east Africa, has broad white spectacles, the white lines conspicuously broader than in west African quailfinch. In *O. a. fuscocrissa* the median breast and flanks have black bars broader than the white bars, and the back is brown, more distinctly streaked blackish than in *O. a. atricollis*.

Next, *O. a. muelleri* Zedlitz, 1911, in east Africa is similar to *fuscocrissa* but the upperparts are nearly uniform with darker, indistinct streaks. The widespread *O. a.*

muelleri occurs from east to southern Africa. In specimens we find little difference between plumage in east Africa (Tanzania) and southern Africa (southern Zambia, Zimbabwe and South Africa). *O. a. bradfieldi* Roberts, 1929, in Namibia, 'grayer and less brown' than South African quailfinch, does not consistently differ between these regions, and as in White (1963) and Immelmann *et al.* (1965, 1977a), *bradfieldi* is considered a synonym of *O. a. muelleri*. In South Africa, *O. a. digressa* Clancey, 1958, specimens are mostly darker than *O. a. muelleri* from south-central Zambia and east Africa, as in Clancey (1977). Nevertheless, not all South African specimens are darker than *O. a. muelleri* from south-central Zambia and east Africa; the dark specimens from Transvaal are worn and soiled (MCZ) when compared with birds in fresh plumage from the same areas (USNM), and these fresh series are not distinguishable from most O. *a. muelleri*. In north-west Zambia, *O. a. minuscula* White, 1946, was described as similar to '*polyzona*', but smaller, the centre of the breast deep rufous (like *fuscata*) and the belly very pale, almost whitish (White 1946). White (1963) later listed *minuscula* as a synonym of *mulleri* [*sic*]. In semi-arid northern Botswana and the Hwange area of western Zimbabwe, *O. a. pallida* are 'paler above and below than *O. a. bradfieldi* Roberts [1929]' (Roberts 1932).

At Lake Bangweulu, Mweru Marsh, Lake Kako and Abercorn (Mbala) in the floodplain region of north-east Zambia, Benson (1955) described *O. a. smithersi* as dark above, almost like *fuscata*. *O. a. smithersi* has broad white spectacles and a white chin like *muelleri*, with rich rufous underparts and mostly black upperparts, with broad black streaks and the grey streaks less extensive than in *fuscata* which it most closely resembles in size. The bill of *O. a. smithersi* is 'mainly sepia' rather than red in the dry season (July–August), perhaps non-breeders; in this region the only breeding record of quailfinch is during the rains in February (Benson 1955).

Other plumage traits that differ between geographic populations of *Ortygospiza* include the intensity of the underparts coloration, and the width of barring on the breast and flanks. None of these traits varies distinctly between taxa (Table 1), except for the darker and more boldly barred *O. a. fuscocrissa* in Ethiopia, compared with quailfinch in adjacent regions. Size does not differ significantly in the samples available, except that *O. a. fuscocrissa* has longer wings and black-chinned *O. a. gabonensis* has shorter wings than the other measured quailfinch (Fry 2004; RBP unpubl.).

Bill colour

Bill colour was formerly reported to differ between black-chinned and white-chinned populations of *Ortygospiza* (Traylor 1963, White 1963). Benson (1955) proposed that this feature could be used to distinguish two species, red-billed *O. gabonensis* and dark-billed *O. atricollis*. In fact, during the breeding season all adult quailfinch photographed or with annotated specimens have red not dark bills, regardless of taxon and geographic location.

Bill colour changes with season; breeding-season males have the upper mandible bright red like the lower mandible (Immelmann *et al.* 1965, 1977a,

Traylor & Parelius 1967). Ten breeding males photographed or collected by RBP in 1995 in northern Nigeria (Jos, Bukuru), and a male in 1999 in The Gambia (Marakissa) and another in Dalaba, Guinea (*O. a. atricollis* and *O. a. ansorgei*, respectively) had bills ranging from partly red to uniformly red (Fig. 1). In Ethiopia, specimens of *O. a. fuscocrissa* have the bill red in November (FMNH 83878) and black in February (FMNH 83874); in birds taken in May, Heuglin (1863) described the bill as blackish above ('rostro nigricante'). In Kenya, van Someren collected two *O. a. muelleri* at Lake Nakuru with a large white chin spot, white eye-ring, large testes (one bird), and uniformly 'coral red' bill (FMNH 203787 in October, FMNH 257714 in December). In Tanzania the holotype of *O. a. muelleri* was a male with a bright red bill ('leuchtend rot'; Zedlitz 1911). In aviaries, male *O. a. muelleri* observed as long as eight years had red bills in each breeding season (RBP); and Ruschin (1972) observed red bills year-round in east African *O. a. muelleri*. In the field, breeding-season birds in Natal, Zambia, Zimbabwe and Botswana also have red bills (Clancey 1965; M. P. S. Irwin *in litt.* 2000), as they do in other regions of Africa.

Juvenile quailfinch have dark bills. As the birds mature, the bills turn reddish, first on the lower mandible (*O. a. atricollis*, Garoua and Ngaoundéré, Cameroon, UMMZ 202407, 232473–75; *O. a. fuscata*, Angola, FMNH 84299, 84300; *O. a. gabonensis*, Congo-Brazzaville, FMNH 213747; observations of non-breeding and breeding *O. a. muelleri* in aviaries: RBP unpubl.).

Allopatry or sympatry of quailfinch taxa

Taxa of quailfinch are mainly allopatric. Near-sympatry between white-chinned ('*Ortygospiza atricollis*') and black-chinned ('*O. gabonensis*') quailfinch has been reported in four regions, yet none of these published reports involved known breeding sympatry. Quailfinch in some regions are seasonal in their local occurrence on floodplains and grasslands, and in the dry season they appear in areas where they are not known to breed. As a result of their seasonal movements, different taxa sometimes occur together.

Chapin (1954) reported two taxa in eastern Ituri, DR Congo, but he recognised only one species, *O. atricollis*. Chapin's report served as the recent basis for concluding that quailfinch comprise two sympatric species (Traylor 1963, 1968, Dickinson 2003). In fact, the birds were taken at different localities. On the Albertine escarpment near Bogoro the birds (*dorsostriata*) lacked white on the face and had the back more streaked black than birds at lower altitudes at Kasenyi (*ugandae*), as at Kasindi and elsewhere west of the Rift and south of Lake Edward. Birds at Bogoro were breeding in September; birds at Kasenyi and west of Lake Albert and Lake Edward were not breeding in January and May (AMNH, BMNH, FMNH). Bogoro specimens include one with ten feathers white at the base of the chin (AMNH 264434); in plumage intermediate between *dorsostriata* and *ugandae*.

The taxon *ugandae* has been considered a synonym of *dorsostriata* (Sclater 1930a, Friedmann & Loveridge 1937). The holotype of *ugandae* (FMNH 257709)

TABLE 1
Plumage and bill characters of quailfinch taxa (male)[1].

Subspecies	Region	Chin white	Throat white	Eye-ring white	Lores white	Back colour	Back streaked	Flanks colour	Belly colour	Bill colour[2]
ansorgei	West	+,(0)	0	0,(+)	0	dark	no	chestnut	chestnut	red
atricollis	West-Central	+	+	0,+	0,(+)	brown	slight	chestnut	chestnut	red
ugandae	upper Nile, E	+	+	(0),+	0,+	brown	slight	tawny	tawny	-
dorsostriata	upper Nile, W	0,(+)	0,(+)	0,(+)	0	brown	some	tawny	tawny	-
gabonensis	W equatorial	0	0	0	0	dark	yes	whitish	whitish	red
fuscata	S–WC	0	0	0	0	blackish	yes	tawny	chestnut	red
smithersi	N Zambia	++	++	++	++	blackish	yes	tawny	chestnut	-
fuscocrissa	Ethiopia	++	++	++	++	brown	some	tawny	tawny	red
muelleri	S to EC	++	++	+,++	+,++	brown	slight	buff	buff	red
pallida	SC	++	++	++	++	pale brown-grey	slight	buff	pale buff	red
digressa	SE	++	++	++	++	dark brown-grey	slight	buff	buff	red

[1]In some taxa characters vary within a region; in Table 1 this variation is represented by two symbols, separated by a comma; that in parentheses is the less common; [2]during breeding season.

from North Kavirondo has a small white chin spot and an incomplete, narrow white eye-ring, which extends around the lores to the bill. It otherwise is nearly identical to a bird with no white on the face (FMNH 118268) from Entebbe, identified as *dorsostriata*; its plumage is intermediate but more like *dorsostriata* than *O. a. muelleri* from southern Kenya (FMNH 257714). Van Someren (1922) noted that *ugandae* has white around the eye and on the chin, whereas *dorsostriata* does not; but male *dorsostriata* sometimes has a little white on the chin, and the back is more distinctly streaked. Finally, on the north shore of Lake Victoria near Entebbe some are intermediate in colour and pattern to the described taxa. Most specimens of quailfinch in Uganda have no notation of large gonads on their labels; and there is no evidence from either field observations or specimens that two taxa breed assortatively in sympatry (Chapin 1954: 500; AMNH, FMNH, BMNH).

In Uganda both *O. gabonensis* and *O. atricollis* were reported at Semliki Wildlife Reserve in a birding guide (Rossouw & Sacchi 1998), but not in the Uganda bird atlas (Carswell *et al.* 2005), which remarked on the difficulty of distinguishing these two forms. M. Wilson (Semliki contributor to Rossouw & Sacchi 1998) has seen only black-chinned birds there; and when he and RBP observed birds in August 2006, only black-chinned birds were seen on Semliki Flats. Semliki is west of the eastern escarpment of Lake Albert; Murchison National Park is east of the same escarpment. These observations do not support the occurrence of two taxa at the same locality. In Uganda one series of reports appears to refer to a single population with continuous plumage variation (van Someren

1921a,b, 1922). In Uganda no seasonal breeding records are known for black-chinned quailfinch, and only one record (June) for white-chinned quailfinch (Brown & Britton 1980, Carswell *et al.* 2005).

Other published reports of sympatric quailfinch are from Zambia, but none involved documented breeding or local sympatry in the breeding season. In north-east Zambia, Benson (1955) noted two taxa of quailfinch, but not at the same locality during the breeding season. *O. a. smithersi* was breeding in the south Bangweulu region in February; both *O. a. smithersi* and *O. a. fuscata* were taken at Abercorn (Mbala), the former on seasonal drying floodplains and the latter on permanently wet grasslands or sponge dambos, and Benson suggested the birds have different habitat preferences.

Second, in north-central Zambia near Ndola and the North Kafue basin, both black-chinned and white-chinned birds have been reported, but the identifications of white-chinned birds are in question. In this region, black-chinned quailfinch are common, and all birds observed in the field and aviaries in this region were black-chinned (Benson & Irwin 1967). At Itawa, Ndola, District Commissioner and resident collector E. L. Button noted for *fuscata*, on the label of specimen FMNH 206576 taken on 3 September 1944, they have 'been in just over a week, now plentiful, found nest with incubated eggs in February and in March'. Penry (1986) found only *O. a. fuscata* breeding at Chingola near Ndola.

Third, in north-west Zambia both white-chinned *muelleri* ['*polyzona*'] and black-chinned *fuscata* occur in November (Benson 1960), but quailfinch do not breed there until the rains in January (White 1946, Benson *et al.* 1971). In the same region Traylor (1963) reported black-chinned and white-chinned birds, but they were in moult and not breeding at this time, November, and were taken in different areas; *fuscata* on the damp floodplain of the perennial South Lueti River, *muelleri* on the Liuwa Plain with only scattered surface water at the end of the dry season (Traylor 1965; FMNH).

Other evidence of movements by quailfinch populations in certain areas is their seasonal occurrence and absence. Quailfinch are regarded as local residents in some areas, near permanent water at the edge of the Kafue Flats, Lochinvar National Park, southern Zambia (Dowsett 1966), but at Mazabuka, within 10 km of the Kafue Flats and 50 km of Lochinvar, they are seasonal visitors during the rains (Winterbottom 1959). They are absent near Choma, southern Zambia, in June–October (Aspinwall 1980). White-chinned quailfinch in Zambia are more widespread and liable to 'considerable local movements depending on habitat conditions' than black-chinned quailfinch, though for the latter too 'some minor seasonal movement remains probable' (Benson *et al.* 1971). In Malawi they undertake local movements and in some areas are seen only in flocks (Benson 1953, Dowsett-Lemaire & Dowsett 2006). In parts of Zimbabwe they undergo 'seasonal wandering' (Irwin 1981), and they are absent in some seasons in the highlands of south-east South Africa (Clancey 1996). In Kenya they are either resident or seasonal, as they appear in some areas

during or after a wet season (both flocks and possible breeders) (Lewis & Pomeroy 1989).

In Zambia and east Africa, the plumages of male quailfinch taken in regions between white-chinned and black-chinned populations are intermediate. (1) In north-west Zambia (Barotseland) on the Liuwa Plain, birds taken by Traylor (1965; FMNH) and first reported as *minuscula* are intermediate between the paler-backed, less streaked *muelleri* of southern Zambia and northern Botswana, and the darker, more streaked *fuscata* in north-west Zambia. Traylor's birds have the white chin of *muelleri* but the white eye-ring is narrower. (2) As in Benson (1955), *smithersi* of north-east Zambia is a mosaic intermediate between the white-chinned '*polyzona*' [=*muelleri*] to the south and the black-chinned *fuscata* to the north. (3) The indistinctly streaked back and the incomplete and narrow white eye-ring of *ugandae* in Uganda are intermediate between traits of *dorsostriata* in the west and *muelleri* in the east. A few recognised as *dorsostriata* in Uganda at Mpumu and Kigambo have some white on the chin (Cowles 1957; BMNH). Sclater (1930a) considered *ugandae* a synonym of *dorsostriata*, whereas Cowles (1957) and Rand *et al.* (1959) suggested that *dorsostriata* is a synonym of *gabonensis*. (4) In the north-west Congo and Gabon, birds identified as *gabonensis* include one specimen with white on the chin (Cowles 1957). More field work may reveal additional information about movements and local variation of quailfinch populations.

In summary, of the records of two taxa of quailfinch in sympatry, in neither Ituri or in Uganda were they in local breeding sympatry. In north-west Zambia they were not in local sympatry and were not seen together in the breeding season, and in north-east Zambia birds were taken in different habitats and not during the breeding season (mainly January–March: Benson *et al.* 1971, Fry 2004), and some may have been seasonal non-breeding visitors. Quailfinch are mainly allopatric, and only in parts of Zambia were they said to 'occur on the same ground' (Britton 1980), but not in the breeding season. There is no direct information that the white-chinned and black-chinned quailfinch of east, central and southern Africa co-occur without interbreeding. Quailfinch are seasonal in occurrence in some areas, absent until the rains, then appear and breed; they are locally migratory, and sometimes occur outside their breeding area. Furthermore, those in both north-east and north-west Zambia (*smithersi* and '*minuscula*') are intermediate between the nearest other populations to the north and south.

mtDNA phylogeny

We obtained sequences of the mitochondrial ND2 gene for 12 specimens representing nearly all recognised taxa across the geographic range of the species (Table 2). We used the following criteria to select specimens for genetic information: 1) the most recent specimens that were available for molecular sampling; mtDNA deteriorates with age and the more recent specimens can be amplified and sequenced with greater accuracy (Payne & Sorenson 2003, Sefc *et al.*

2003, 2006); 2) in North American museums; and 3) voucher specimens were compared with other series to validate the identification.

Laboratory methods were identical to previous studies (Sorenson *et al.* 2004, Sorenson & Payne 2005) except that estrildid-specific internal primers were used to permit the amplification and sequencing of smaller DNA fragments from older specimens. Primer pairs for tissue samples were L5216rv and H5766rv (Sefc *et al.* 2003), and L5758rv (5'-GGNGGNTGAATRGGNYTNAAYCARAC-3') and H6313rv (5'-ACTCTTRTTTAAGGCTTTGAAGGC-3'). Additional internal primers included L5476.E (TTYKCYAGYATRAYYAAYGCATG), H5481 (TGNGTRATRTCYCAYTGDCCNGT), L6007.E (TCHCTNGCAGGNYTNCCNCC), and H6022.E (GTHAGTTCTTGGATGATNAGTCATTTTGG); primer names refer to the strand and position of the 3' base in the *Gallus gallus* mtDNA sequence (Desjardins & Morais 1990). ND2 sequences for the three *Amandava* species and two *Amadina* species were used as the outgroup. Phylogenetic analysis based on parsimony and maximum likelihood (ML) produced identical results. The latter analysis used a general time-reversible model of nucleotide substitution with an estimated proportion of invariant sites; model chosen based on AIC value as calculated in MODELTEST (Posada & Crandall 1998) using parameters estimated from the data. Genetic distances reported below are ML estimates based on the same model and parameter values.

These data produced a single well-supported monophyletic tree (Fig. 2) with three distinct and genetically divergent clades. (1) A clade including west African

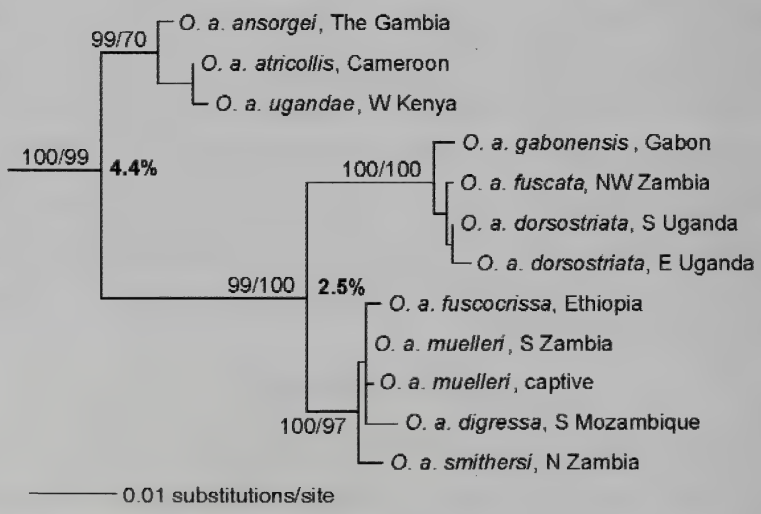

Figure 2. Phylogeny of quailfinch mitochondrial DNA lineages based on complete sequences of the ND2 gene (outgroup taxa not shown). Branch lengths are proportional to maximum likelihood (ML) estimates of number of substitutions per nucleotide. The mean ML genetic distance across the two basal nodes is shown. Parsimony and ML bootstrap values are shown for the primary groups on the tree.

TABLE 2
Sources and voucher specimens of genetic samples.

Taxon	Locality	Year	Tissue[a]	Voucher specimen
ansorgei	Marakissa, The Gambia	1996	1	UMMZ 234175
atricollis	Ngaoundere, Cameroon	1992	1	UMMZ 232472
ugandae	Mumias, North Kavirondo, western Kenya	1917	2	FMNH 257709
muelleri	captive (parents known)	1993	1	UMMZ 233156
muelleri	Lochinvar National Park, southern Zambia	1972	2	UMMZ 219735
digressa	Beira, Mozambique	1965	2	UMMZ 211483
fuscocrissa	Gojam, Ethiopia	1927	2	FMNH 83874
dorsostriata	Entebbe, eastern Uganda	1915	2	UMMZ 94816
dorsostriata	Masaka, southern Uganda	1916	2	FMNH 91697
fuscata	Kawambwa, northern Zambia	1953	2	UMMZ 222394
gabonensis	Ogooué-Maritime, Gabon	1951	2	FMNH 210584
smithersi	Abercorn, northern Zambia	1954	3	AMNH 648202

[a] Tissue used for genetic analysis. 1: muscle tissue; 2: single feather from specimen; 3: toe pad tissue from specimen.

ansorgei, *atricollis* and *ugandae* is basal to the other two. (2) Black-chinned taxa in central Africa, *gabonensis*, *fuscata* and *dorsostriata*, form a second clade, and (3) the white-chinned taxa occurring from eastern to southern Africa (*fuscocrissa*, *muelleri*, *smithersi* and *digressa*) form a third clade. Relatively large genetic distances between clades (2.5–4.4%) combined with limited intra-clade differentiation suggest long-term historical isolation of quailfinch populations in different regions, dating perhaps a million years or more (e.g. Fleischer *et al.* 1998, Arbogast *et al.* 2002, 2006).

The results on the basis of genetic monophyly are consistent with the possibility of one, two or three species of quailfinch. However, if two species were recognised, these would be west African *O. atricollis* (Vieillot, 1817) (clade 1 in the gene tree) and central and east African *O. fuscocrissa* Heuglin, 1863 (the oldest-named taxon in clades 2 and 3 in Fig. 2), and this clade would include black-chinned *gabonensis*. These two clades do not correspond to any previously suggested arrangement for quailfinches. The main conclusion from the genetic data is that we reject the recognition of two species, one with a white chin and one with a black chin. The three clades are consistent with the three *Rassengruppen* of a single species of quailfinch as described by Wolters (1975) and recently recognised as three species (Fry 2004). The mostly 'white-chinned' quailfinch of west Africa are basal to a clade comprising black-chinned quailfinch of central Africa and spectacled quailfinch of eastern and southern Africa. In conclusion, the genetic data are consistent both with one species (*O. atricollis*) and with three species (*O. atricollis*, *O. fuscocrissa*, *O. gabonensis*), and do not support the hypothesis of two species (*O. atricollis* and *O. gabonensis*).

Song

Vocalisations of quailfinch include a short contact-call, a harsh *klek* that rises quickly to 3–4 kHz and persists for *c*.0.07–1.0 sec, and a song (here, 'loudsong') characterised by a harsh pattern of irregularly alternating notes given in phrases that repeat with some variation, as *klik klak kloik kluk klek* (Immelmann *et al.* 1965, Goodwin 1982, Nuttall 1993, Payne & Payne 1994). The loudsongs continue for up to several seconds. The loud *klek* contact-calls and *klik klak kloik* loudsongs develop from modulated calls given by young after they fledge and are heard in flocks with juvenile quailfinch (Payne & Payne 1994). Female loudsongs are short and discrete (Nuttall 1993; RBP unpubl.), whereas male loudsong phrases repeat over time with minor variations of the sequence of notes in the *klik klak kloik* motifs (Fig. 3; compare with Nuttall 1993, Fig. 5, where labeled as 'contact phrase' rather than 'song'). These same elements of loudsong are also given as contact-calls and rattling flight-calls. Loudsongs are usually given on the ground. In RBP's aviaries, the birds began loudsong well before bright lights-on or sunrise. Shorter versions of loudsong also are given on the ground in the field and in the flight aviaries where the birds bred successfully. In Fig. 3, according to the field recordists' notes (http://www.bl.uk/collections/sound-archive/cat.html, viewed 9 November 2006), songs a, b, d, e, f and j were of perched birds, as probably was song k (the recordist 'saw it well'). Songs c, g, h and i lack data on context. In both form and context, most vocalisations in Fig. 3 are loudsongs, either complete or incomplete (*contra* Nuttall 1993, 2005, who did not recognise these as 'song'); the other vocalisations consist of the same kinds of shorter calls. Calls and songs have the same acoustic elements in several other estrildids as well (e.g., Immelmann 1969, Nicolai 1964, Güttinger 1970, Zann 1975, 1976, Payne & Payne 1994).

Loudsongs of quailfinch are similar throughout their distribution. The *klik klak kloik...* songs of 'white-chinned' birds in The Gambia, Nigeria and Cameroon (Barlow *et al.* 2002; British Library Natural Sound Archive [NSA]; RBP), Murchison National Park, Uganda (RBP), southern Zambia (Stjernstedt 1993; NSA) and South Africa (Nuttall 1993; NSA), and in 'black-chinned' birds in northern Zambia (Stjernstedt 1994; NSA) are all similar. The loudsongs have hoarse notes given in irregular sequence, sometimes the first higher and the last lower; one long, the second mid length, and the third short (Fig. 3). Penry's (1986) *take it away* and *drink* descriptions of flight-calls of black-chinned birds in northern Zambia apply equally to white-chinned *O. a. muelleri* elsewhere in Zambia and to white-chinned *O. a. atricollis* in Cameroon and Nigeria (Payne & Payne 1994; Fig. 3). *Take it away* is also a motif in the loudsong *klik klak kloik*. In Ethiopia, the songs of white-chinned *O. a. fuscocrissa* were described in similar terms, ' . . . die Stimme ist ein ziemlich unmelodisches Pipen, das oft schnarrend klingt und weit weniger fein, als bei den vorhergehenden' (Heuglin 1863). In north-west Zambia, when a black-chinned male quailfinch '*O. gabonensis*' was collected, 'the call did not differ in any way from that of *atricollis*' (S. Keith *in* Benson & Irwin 1965). Quailfinch in the

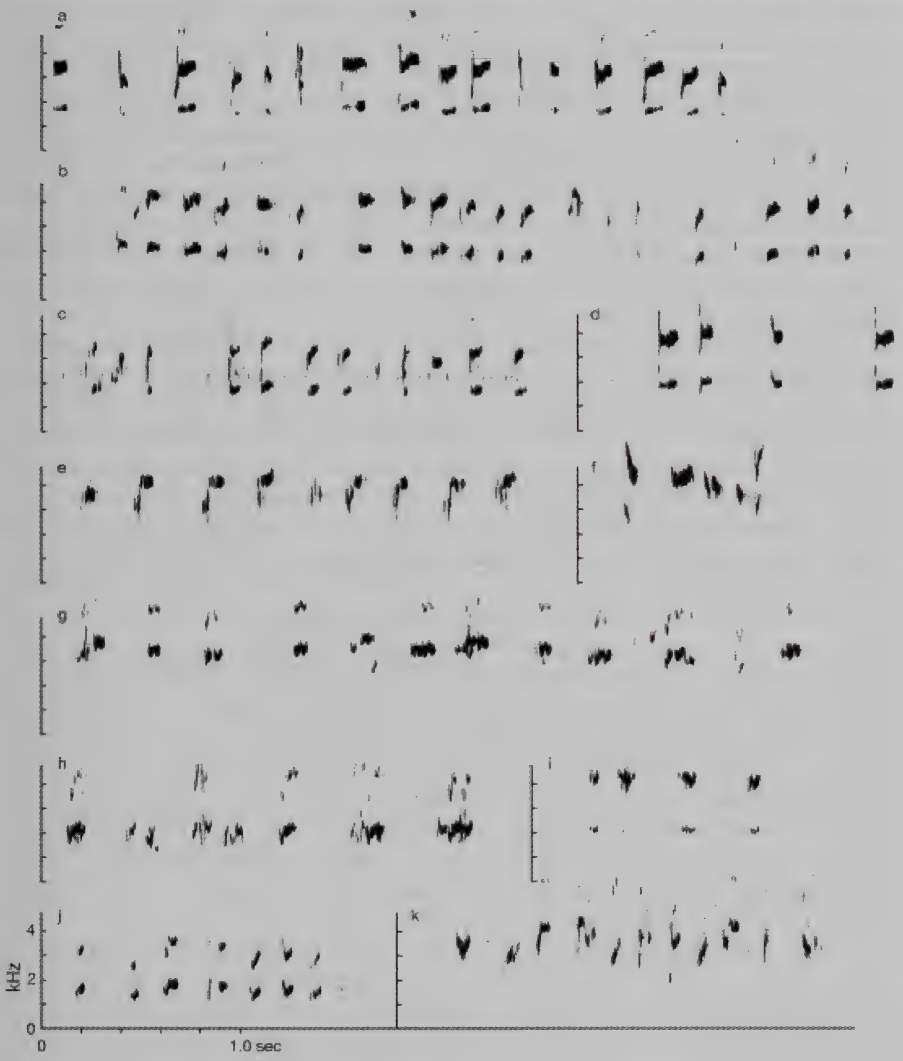

Figure 3. Loudsongs of quailfinch *Ortygospiza atricollis*. (a) *O. a. ansorgei*, captive (UMMZ 232576); (b) *O. a. atricollis* <> *ansorgei*, Sifoe, The Gambia (Barlow *et al.* 2002; UMMZ 234175); (c–d) *O. a. atricollis*, c, Zaria, Nigeria (NSA 3635); d, Rayfield, Nigeria, 3 November 1995 (RBP 49A); (e–g) *O. a. muelleri*, e, male b/b, captive (RBP 1996 tape 70b, UMMZ 236155); f, female r/r, captive (RBP 1991 tape 20b, UMMZ 234138); g, South Africa, Kruger National Park (Gillard 1987); (h–j) *O. a. fuscata*, Itawa, Ndola region, northern Zambia (h, NSA 26681; i, NSA 26692; j, NSA 81087; k, NSA 25769).

Ndola region of northern Zambia (including Chingola and Itawa Swamp) were identified as black-chinned *fuscata*. Recordings of these birds were examined (NSA 34109, 34110, 25769, 26681, 26692, 81085, 81087). A bird recorded at Itawa Swamp on 4 May 1991 was 're-identified' as (white-chinned) '*O. atricollis*' on an edited copy of NSA 25769; and this edited copy is suspect, both for acoustic parameters and for the re-identification. Chappuis (2000) reported that calls of black-chinned birds at Itawa, near Ndola, Zambia, were more shrill than white-chinned birds, but no difference is evident in the unedited NSA recording or in published cassettes (Stjernstedt 1993, 1994). The modulated 'shrill' sounds in certain recordings (not all calls are shown in Fig. 3) appear to be calls of juveniles (Payne & Payne 1994).

The pitch of calls may vary with excitement level. Penry's (1986) idea of species-distinctive pitch and modulation in calls of black-chinned and white-chinned quailfinch is not supported by his audiospectrograms, nor do differences appear in larger series of recordings, where both black-chinned and white-chinned birds give loudsongs either over or under 4 kHz (Fig. 3). Song recordings of quailfinch vary in the presence and loudness of an undertone of the loud trace at 4 kHz. The occurrence of sounds above and below the fundamental frequency (the loudest trace on the audiospectrogram) appear to vary with loudness of the call, the excitement of the bird, and the recording conditions (overtones often occur in 'over-recorded' samples with settings of recorder sensitivity producing artefacts, and undertones are not prominent in birds recorded at close range in captivity). Additionally, the undertones appear more often in notes of 4 kHz or higher than in lower notes. The overtone and undertone amplitudes at different frequencies are easily distorted, and the relative amplitudes may vary with recording conditions (Wickstrom 1982). Acoustic harmonics vary with a male's distance to his mate not only in quailfinch (Nuttall 1993) but also in another estrildid, *Poephila acuticauda* (Zann 1975). This modulation of song overtones may be effected by active neural control of resonance filtering (Beckers *et al.* 2003). In consequence, we do not emphasise the acoustic overtones and undertones; we merely point to their occurrence and prominence in the quailfinch.

A third vocalisation is a soft 'burbling' song of irregularly repeated downslurred notes of short (<0.05 s) duration. This soft 'burbling' or 'scissors-grinding' song is used in sexual behaviour at close range and at the nest. Soft song is delivered at an amplitude *c.*10–15 dB lower than loudsongs (Payne & Payne 1994). Soft songs are similar in west African and southern African quailfinch (*O. a. ansorgei* and *O. a. atricollis*, and *O. a. muelleri*) (Nuttall 1993, Payne & Payne 1994); no recordings of soft songs are available for black-chinned quailfinch.

Nestling mouth pattern and colour

Nestling mouth markings have been used to diagnose closely related estrildid finches (Nicolai 1987). Nestlings and fledglings have distinctive mouth patterns and colours they display to the adult when begging for food. These may offer visual

signals that aid in behavioural recognition and parental care. In some estrildids, young with atypical mouths receive less food and survive less well than young with the species-typical mouth patterns and colours (Immelmann *et al.* 1977b, Payne *et al.* 2001). For this reason, nestlings with different mouth patterns and colours might not have the visual signals necessary for parental care. If nestling mouth patterns and colours differed between birds, lower fitness of 'hybrid' offspring might present a barrier to successful interbreeding (Payne 2005).

In nestling and fledgling quailfinch the mouth has three greenish-blue balls each side of the gape, a black gape between them, and a yellowish palate with six black spots, a pattern of colours and spots that differs from all other estrildids (Payne 2005). Recently fledged young in a family group of *O. a. atricollis* photographed in Cameroon at Ngaoundere in 1992 (UMMZ) have the same mouth colours and patterns as nestlings throughout the range of white-chinned quailfinch in Nigeria (*O. a. atricollis*), Kenya and South Africa (*O. a. muelleri*) (Serle 1938, van Someren 1956, Schifter 1964, Kunkel 1966, Nuttall 1992, Payne & Payne 1994, Payne 2005). Mouths and palates of young *O. a. fuscata* of the black-chinned *gabonensis* complex are apparently the same as in the other known quailfinch (Chapin 1954, Payne 2005). There is no evidence of different nestling begging signals and mouth colours between quailfinch taxa that would affect whether a brood is reared successfully.

Discussion

To assess systematic status of quailfinch taxa, we combine information on morphology, distribution, behaviour and molecular genetics as analysed in a phylogenetic context. The uniformity across quailfinch taxa in song and bill colour of adults, and in the mouth colours and patterns of nestlings, indicates a single species, *Ortygospiza atricollis*. In addition, no geographically neighbouring taxa of quailfinch are known to breed assortatively in sympatry, whereas in many cases they intergrade morphologically: *atricollis* with *ansorgei* and *ugandae*; *ugandae* with *dorsostriata*; *smithersi* with *fuscata* and *muelleri*; and *fuscata* with '*minuscula*' and *muelleri*. The migratory behaviour of some populations may lead them to co-occur in the non-breeding season, but reported cases of sympatry involve birds that breed in different localities; for example, in Ituri, breeding populations of *ugandae* and *dorsostriata* are 50 km apart (Chapin 1954). Plumage variation in *Ortygospiza* (Table 1) indicates only one or two character differences between neighbouring taxa in most instances. The gradation of plumage between taxa, the lack of known local breeding sympatry, and the consistency of songs across taxa are consistent with previous conclusions of a single species (Friedmann & Loveridge 1937, Chapin 1954, Benson 1955, Traylor & Parelius 1967). These reports, like those of museum workers (Sclater 1930a, Wolters 1975, 1985), recognised quailfinch as a single species because the variation in plumage pattern and colour between the black- and white-chinned forms is no greater than variation between subspecies.

With genetic data, one approach to the recognition of species is the genetic distance between clades: the percentage of nucleotide sites that differ between

sequences, sometimes based on a single gene and on an arbitrary ratio of the variation within and between nominal species (Hebert *et al.* 2004). However, there is no agreement in genetic distance across sister species of birds. For example, the arbitrary threshold noted above is poor in predicting species status in other estrildids, in which family we find numerous examples of both small genetic distances between sister species (e.g., <1.0%) and deep genetic distances within a species (up to 6%; Sorenson *et al.* unpubl.). Genetic distances vary greatly among different lineages and the level of difference between species in one lineage does not predict the difference in other lineages (DeSalle *et al.* 2005). In other animals, the error rate of recognising or not recognising known species on the basis of genetic distance is as great as 30% (Meyer & Paulay 2005, Hickerson *et al.* 2006, Meier *et al.* 2006).

A phylogenetic analysis of genetic data in quailfinch suggests the recognition of either one or three clades as species. In general, though many clades are species, not all are so (i.e., some clades distinguish families and genera, e.g. Sorenson & Payne 2005, whereas at the other end of the scale, some mitochondrial lineages simply trace maternal kinship, e.g. Avise 2004, Payne *et al.* 2002). Furthermore, not all genes differ between related species (Avise 2004). For example, in *Vidua* finches, several species share the same mitochondrial gene sequences, due to incomplete lineage sorting between species that derived from a polymorphic ancestor, and to hybridisation (Sorenson *et al.* 2003). In *Poephila* finches, different nuclear genes provide discordant estimates of phylogenetic relationships between species. Nevertheless, mitochondrial gene trees are concordant with a majority of nuclear gene trees from the same birds (Jennings & Edwards 2005). In addition, although ND2 is slightly more variable than ND3 and Cyt-*b*, their nucleotide sequences give nearly identical phylogenetic results in other songbirds (Zink & Weckstein 2003). These observations support the use of mtDNA at the species level in the finches, with one variable sequence (ND2) being representative of other such sequences (Jennings & Edwards 2005, Edwards *et al.* 2005).

Within the framework of an integrative species concept, the more important question is whether genetic differences are congruent with morphological and/or behavioural differences between taxa. Additional information is necessary before we can determine the biological and evolutionary significance of a clade (Avise 2004). For example, does a clade correspond to birds with the same morphology, the same songs, and a geographic distribution that overlaps that of a closely related population—three criteria that are necessary to consider in determining at which level a clade corresponds to a species. Because collectively the quailfinch are monophyletic, they form a pattern of ancestry and descent, a generally necessary condition but not a sufficient condition for recognising a species. Certain clades are recognisable within the collective clade, yet the lack of a mutually exclusive and morphologically diagnosable set of morphological characters (Table 1) suggests it is inappropriate to recognise any one included clade as a species. The idea of two quailfinch species is unsupported by the genetic data, because the lineages in

'white-chinned' taxa are paraphyletic, as are the taxa in '*atricollis*' as recognised by White (1963). Based on his interpretation of our genetic phylogeny, Fry (2004) divided quailfinch into three species diagnosable by the presence or absence of a few key plumage characters; conspicuous white spectacles ('*O. fuscocrissa*'), a lack of white on the chin and face ('*O. gabonensis*'), and presence of a white chin but no prominent white on the face ('*O. atricollis*'). However, these characters vary both within and between the three lineages recovered in a phylogenetic analysis of mtDNA nucleotide sequences (Table 1, Fig. 2), and there is morphological evidence of gene flow in regions where the different plumage taxa almost meet. Although the genetic data suggest that quailfinch populations were isolated in three different regions for a significant part of their history, the contact in current distributions and observations of birds intermediate in plumage do not support a conclusion that the three clades correspond to species-level lineages that are on independent evolutionary trajectories. Of course the tree topology also suggests distinct genetic lineages or independent evolutionary pathways, but we cannot know the future or whether the lineages will combine again before they become extinct; we can only interpret the past from data that link the birds at the present time (de Queiroz & Donoghue 1988, O'Hara 1994, de Queiroz 1998).

When results from single genes yield unresolved phylogenetic trees, it is desirable to determine the phylogenies of multiple genes. In the present case, the gene tree based on ND2 gene sequences is well supported, and adding more mtDNA data is unlikely to change our inferences. It might be of interest to recover genetic sequence data within a large sample; that is, to test the robustness of the two most basal branching points in the phylogenetic estimate in Fig. 2. And data from nuclear loci would be of interest, but many specimens in our study range in age up to 90 years. Obtaining nuclear sequence data from these older specimens would require a great deal of additional effort and expense; and, given the relatively limited sampling in the field, particularly from regions of contact between subspecies, it is not clear to us that these data would add much to the present analysis. More extensive and intensive sampling in zones of overlap would be helpful, as with *O. a. ugandae* to test its association with *O. a. atricollis*, *O. a. dorsostriata* and *O. a. muelleri*: recently collected specimens are simply unavailable. Additional geographic sampling and analysis of nuclear loci also would provide a better understanding of the historical structure and current extent of genetic exchange between populations, and a large sample would be necessary to distinguish between variation within and between taxa. Presumably, geographic isolation of quailfinch populations in the past explains the three divergent genetic clades. Though subsequent expansion and shifts in distribution have probably brought them back into contact in certain areas, their contemporary distributions are largely non-overlapping.

The morphological variation within and among quailfinch taxa, the absence of documented breeding sympatry, the seasonal movements of birds between breeding and non-breeding areas, and the similarity in songs all suggest gene flow between

adjacent populations and the lack of divergence in signaling systems that would occur in speciation. Together with the molecular phylogeny these observations lead us to conclude that quailfinch are best recognised as a single, geographically variable species, *O. atricollis*.

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Records of rare birds in the Indian Ocean during the austral summers of 2003–05

by Richard R. Veit, K. David Hyrenbach & Marie-Caroline Martin

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On 2 January 2003 RRV and KDH left Réunion aboard the *R/V Marion Dufresne*, stopped at Île de la Possession (Crozet archipelago) and Grand Terre (Kerguelen archipelago), St Paul and Amsterdam Island, and arrived at Fremantle, Australia on 22 January. In 2004, RRV and M-CM left Réunion on 3 January, stopped at Mauritius, Mayotte, Île de la Possession, and Kerguelen and then, together with KDH, returned to La Réunion on 10 February. In 2005, RRV and M-CM left La Réunion on 12 January and returned, after spending five weeks near Kerguelen, on 22 February (Fig. 1). The following observations appear to be of particular interest.

JUAN FERNÁNDEZ PETREL *Pterodroma externa*

We saw one Juan Fernández Petrel in 2003 and three in 2004, the first records of this south-temperate Pacific species for the Indian Ocean, though the closely related White-necked Petrel *P. cervicalis* has been recorded north of the Crozets (Shirihai 2003). Juan Fernández Petrels breed only at Alexander Selkirk Island, Juan Fernández archipelago (33°S, 81°W), and disperse into the Pacific between 20°N and 50°S, west to *c.*160°W. There are records of vagrants from Australia, New

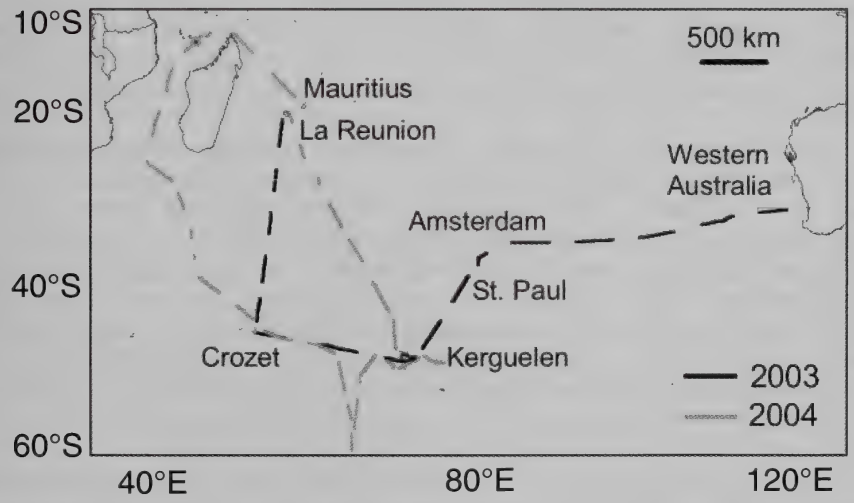

Figure 1. Map of the Indian Ocean, showing the areas surveyed in 2003 (2–22 January, black) and 2004 (3 January–10 February, grey), and the islands visited.

Zealand and the South Atlantic (Falla *et al.* 1981, Brooke 1987, Harrison 1990, Marchant & Higgins 1990, Shirihai 2003) including individuals prospecting ashore at the Chathams, New Zealand and New South Wales, Australia (Marchant & Higgins 1990, Imber *et al.* 1991), suggesting that vagrants at sea have been overlooked.

Juan Fernández Petrel is a distinctive species, likely to be confused mainly with Barau's Petrel *Pterodroma baraui*, which nests on La Réunion and Rodríguez, and disperses in tropical waters around these archipelagos and south to the Subtropical Convergence (Stahl & Bartle 1991, Jacquemet *et al.* 2004). Because on both our cruises we saw *c.*200 Barau's Petrels, we noticed several features that distinguish them from the larger and heavier Juan Fernández Petrel (Harrison 1987, 1996). Other species with which *P. externa* could be confused include *P. cahow* of Bermuda, *P. hasitata* of the Caribbean, *P. sandwichensis* of Hawaii and *P. phaeopygia* of the Galápagos. *Cahow* and *hasitata* can be quickly eliminated by the broad transverse bar on the underwing, heavier than on *baraui*, whilst *sandwichensis* and *phaeopygia* are much darker dorsally than either *externa* or *baraui*, have more extensive dark hoods that extend onto the neck-sides and more prominent transverse bars on the underwing.

The 2003 Juan Fernández Petrel was observed by RRV alone, at 12.15 h on 7 January, near 38°48.36'S, 52°58.8'E. It was with a Great Shearwater *Puffinus gravis* and approached to *c.*30 m of the ship during the 3–4-minute observation. The bird was about the same size as the Great Shearwater with a very heavy bill, similar to that of Great-winged Petrel *Pterodroma macroptera*, which was common in the area. The back and upperparts were uniformly dark gray, including the rump. The cap was black and the forehead white, as in Barau's Petrel. The underparts were all white, as were the underwings, except for a tiny blackish transverse bar that extended backwards and towards the body, and which was much smaller and less conspicuous than in Barau's Petrel, lending a very different impression to the underwing pattern. In 2004, three Juan Fernández Petrels were seen on 5–7 February. The first was seen by E. Milot and KDH, and the other two by four observers (RRV, E. Milot, J. Deere & P. Nolan) (Fig. 2). All were noticeably larger than Barau's Petrels, had the distinctive *externa* underwing pattern and a contrastingly grey back distinct from the Barau's Petrels we saw. Some *externa* have patchy whitish uppertail-coverts that afford the semblance of a whitish rump patch (e.g. Harrison 1996), though others lack this (www.oceanwanderers.com/JFPE01.jpg). The bird in 2003 lacked a whitish rump; we did not notice whitish feathers on the rumps of the 2004 birds, but we did not specifically look. The presence of whitish rump feathers on *Pterodroma* can be difficult to ascertain, as white underparts feathering often wraps around to give the appearance of a white rump as, for example, on some raptors. RRV checked specimens at the American Museum of Natural History, New York, and found that whilst freshly moulted Barau's Petrels in September have grey backs, as do recently fledged juveniles in March–May, worn birds in January–February appear uniformly dark above.

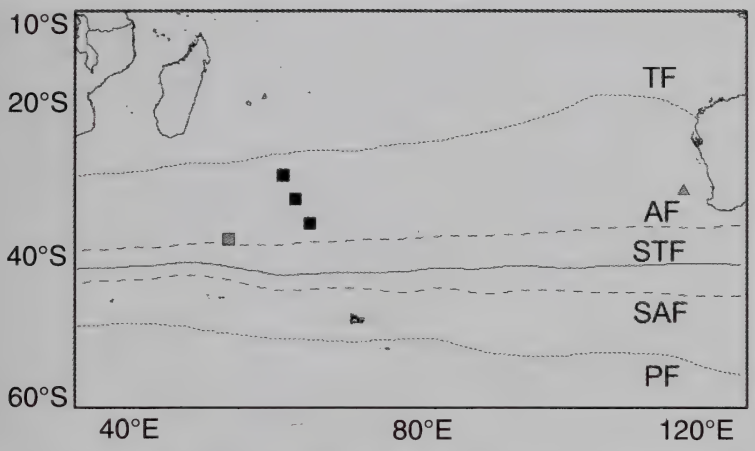

Figure 2. Distribution of Juan Fernández Petrels *Pterodroma externa* (squares) and White-necked Petrels *P. cervicalis* (triangle) in 2003 (grey) and 2004 (black), superimposed over the major frontal systems in the region, defined in terms of sea surface temperature (SST) characteristics: Tropical Front (TF, 25°C), Agulhas Front (AF, 17°C), Subtropical Front (STF, 13°C), Subantarctic Front (SAF, 10°C) and Polar Front (PF, 4°C). SST data are a composite for the survey period, obtained by averaging nine concurrent weekly composites of the Reynolds Optimally Interpolated dataset (PODAAC product 19) based on a combination of AVHRR satellite and in situ data, with a spatial resolution of 1 × 1 degree (http://poet.jpl.nasa.gov/).

Juan Fernández Petrel has a subtropical distribution, whereas Barau's Petrel is a tropical species. Our observations of *externa* were all well south of the aggregations of *baraui* that we observed, and in substantially cooler water. In fact, there was almost no overlap in the distributions of the two species, suggesting that, as in other species of *Pterodroma*, habitat selection follows oceanographic boundaries.

WHITE-NECKED PETREL *Pterodroma cervicalis*

One observed by KDH and RRV between Amsterdam Island and Australia, on 21 January 2003, near 32°18.09'S, 11°57.84'E (Fig. 2), was similar to the Juan Fernández Petrels described above, but had a conspicuous white collar and a more pronounced transverse bar on the underwing. White-necked Petrel breeds on Macauley, in the Kermadec Islands (1,000 km north of New Zealand), and migrates to the north-west Pacific (Brazil 1991, Bregulla 1992, Tanaka & Inaba 1981). They appear regularly off the east coast of Australia (Marchant & Higgins 1990) and there is a single record from the Indian Ocean, near Île des Pingouins, Crozet, on 8 February 1982 (Stahl *et al.* 1984).

BULWER'S PETREL *Bulweria bulweria*

On 4–5 January 2003, we recorded 12 between 22°20.28'S, 54°59.16'E and 29°59.16'S, 54°05.52'E, *c.*800 km south of La Réunion. We saw an additional five

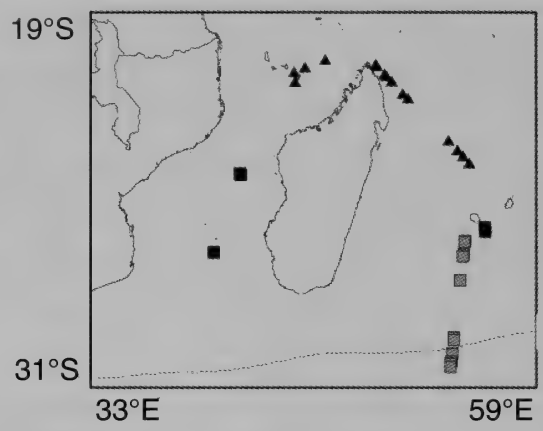

Figure 3. Distribution of Bulwer's Petrels *Bulweria bulweria* (squares) and Jouanin's Petrels *B. fallax* (triangles) in 2003 (grey) and 2004 (black). The hatched line indicates the mean location of the Tropical Front (SST: 25°C). SST data are a composite for the survey period, obtained by averaging nine concurrent weekly composites of the Reynolds Optimally Interpolated dataset (PODAAC product 19) based on a combination of AVHRR satellite and in situ data, with a spatial resolution of 1 × 1 degree (http://poet.jpl.nasa.gov/).

in 2004: three between Île Europa (22°S, 40°E; west of southern Madagascar) and 30°S, on 14–15 January, and two more south of La Réunion on 9 February (Fig. 3). Marchant & Higgins (1990) show no records west of Madagascar (though it is known from this region: Ryan *et al.* 2006), and suggest that the southern extent of their range is near 25°S, south of La Réunion. The sightings above extend the pelagic range south and west by *c.*400–700 km (Harrison 1987, 1996).

JOUANIN'S PETREL *Bulweria fallax*

We observed 21 between Mauritius and Mayotte on 5–9 January 2004 (Fig. 3). The northernmost was near 11°48.04'S, 46°46.01'E), *c.*1,200 km north of Mauritius. All were in tropical waters, characterised by sea surface temperatures above 25°C.

AUSTRALASIAN GANNET *Morus serrator*

A pair at a nest on St Paul Island (38°41'S, 77°33'E), on 16 January 2003. Both this species and Cape Gannet *M. capensis* have been recorded intermittently at St Paul since 1986 (LeQuette *et al.* 1995). Nests with eggs of both species have been found, but it is unknown whether either taxon has successfully fledged young.

PECTORAL SANDPIPER *Calidris melanotos*

One found, by B. Gangloff and F. Dulac, on a small pond in the south-east Courbet Peninsula, Kerguelen, on 4 February 2005. Photographs clearly eliminate the similar Sharp-tailed Sandpiper *C. acuminata* (Fig. 4). Previously recorded at the Prince Edwards (Shirihai 2003), in Seychelles (Feare 1979) and on islands off

Figure 4. Pectoral Sandpiper *Calidris melanotos*, Courbet Peninsula, Kerguelen, 4 February 2005 (F. Dulac)

Madagascar (Sinclair & Langrand 2003), but away from Madagascar the species has been seen fewer than five times in the Indian Ocean and never before on Kerguelen.

LONG-TAILED JAEGER *Stercorarius longicaudus*

Long-tailed Jaegers breed in the arctic and winter in temperate portions of the Southern Ocean, especially in areas of high oceanic productivity (Lambert 1971, 1980, Veit 1984). Published range maps (e.g. Harrison 1996) indicate that the species does not occur in the Indian Ocean, though Shirihai (2003) noted that they are 'also common off southeast coast of Africa north to at least S Mozambique' and Hockey *et al.* (2005) indicated regular occurrence in the western Indian Ocean. Thus, whilst there appears to be strong evidence that the species occurs along the western margin of the Indian Ocean, we report the first Indian Ocean records away from the African coast and Mozambique Channel (Ryan *et al.* 2006). The species is probably overlooked, given its resemblance both to other jaegers and to Sooty *Sterna fuscata* and Bridled Terns *S. anaethetus*.

In all years combined (2003–05) we saw *c.*70 Long-tailed Jaegers (Fig. 5), identified by their shape (long narrow wings, long and narrow tail apart from the central streamers), contrast between blackish remiges and grey upperwing-coverts, the limited number of white primary shafts (never more than two, and on many birds none was visible) and, on some birds, by the elongated, narrow and pointed central rectrices (Harrison 1987, 1996).

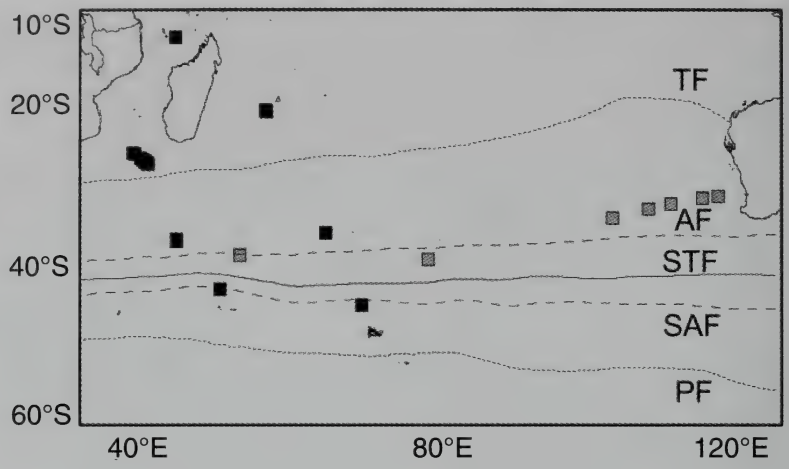

Figure 5. Distribution of Long-tailed Jaeger *Stercorarius longicaudus* sightings in 2003 (grey) and 2004 (black), superimposed over the major frontal systems in the region, defined in terms of sea surface temperature (SST) characteristics: Tropical Front (TF, 25°C), Agulhas Front (AF, 17°C), Subtropical Front (STF, 13°C), Subantarctic Front (SAF, 10°C) and Polar Front (PF, 4°C). SST data are a composite for the survey period, obtained by averaging nine concurrent weekly composites of the Reynolds Optimally Interpolated dataset (PODAAC product 19) based on a combination of AVHRR satellite and in situ data, with a spatial resolution of 1 × 1 degree (http://poet.jpl.nasa.gov/)

As off Africa (Lambert 1971, 1980, Ryan 1989) and South America (Veit 1984), the Long-tailed Jaegers we observed were concentrated over oceanic regions of steep physical gradients. The species was mostly associated with the Subtropical Convergence, and the confluence of the Subtropical and Subantarctic convergences north of the Crozets. Previously, Stahl *et al.* (1984) reported 23 jaeger sightings between Réunion and the Subantarctic Front in late spring / early summer (7 December–10 March), of which 15 were identified to species and one, seen halfway between Réunion and Crozet (35°S, 50°E), was a Long-tailed Jaeger. The species has also been recorded in the Benguela Current (Abrams 1983, Lambert 1980), in the Agulhas Retroflection south of South Africa (Ryan 1989), and in Subtropical Zone waters in the African sector of the Indian Ocean (15°W–35°E, 35–70°S) (Abrams 1985).

SOOTY TERN *Sterna fuscata*

We saw an adult from the *Marion Dufresne* whilst anchored off the north side of St Paul, on 16 January 2003. Sooty Tern apparently bred at St Paul in the past (Segonzac 1972) but was extirpated by rats. There are no recent breeding records.

LESSER CRESTED TERN *Sterna bengalensis*

One feeding with *c.*40 Common Terns *S. hirundo* in Port Louis harbour, Mauritius, on 5 January 2004 (RRV). There are three previous records from Mauritius, the most

recent in 1991 (see Safford & Basque 2007). According to Harrison (1987, 1996) the species does not ordinarily occur south of northern Madagascar, but does so regularly in the Cape region of South Africa (Hockey *et al.* 2005).

Acknowledgements

We are grateful to the officers and crew of the *R/V Marion Dufresne*, to the French Ocean Indien Service d'Observation (OISO) programme, and to the French Polar Institute Paul-Emile Victor (IPEV) for making our participation in these cruises possible. H. Weimerskirch and J.-C. Stahl made unpublished observations available. Comments from Peter Ryan and an anonymous reviewer greatly improved the manuscript. The US National Science Foundation Office of Polar Programs supported KDH (OPP-0234570 to G. L. Hunt) and M-CM / RRV (OPP-9983751 to R.R. Veit).

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Taxonomy of *Chlorospingus ophthalmicus* in Mexico and northern Central America

by Luis A. Sánchez-González, Adolfo G. Navarro-Sigüenza, A. Townsend Peterson & Jaime García-Moreno

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Despite a broad latitudinal distribution, Neotropical humid montane forests ('cloud forests') are fragmented because they require specific environmental conditions, especially high humidity and altitude. Therefore, they occur in areas with steep slopes and high moisture input from clouds and mist (Brown & Kappelle 1995, Webster 1995). In Mesoamerica, cloud forests are highly fragmented, whereas in South America they constitute a more continuous band stretching 3,000 km through the Andes. Such characteristics make cloud forests intriguing (Foster 2001): this biome has witnessed the evolution of astonishing biological diversity, with large numbers of endemic taxa, many of them highly range-restricted (Fjeldså & Krabbe 1990, Gentry 1995, Hernández-Baños *et al.* 1995, Campbell 1999, Navarro *et al.* 2001). This diversity has been explained via hypotheses of how past climatic change affected cloud forests, provoking vertical and horizontal movements of different

magnitudes (Wijninga 1995), and permitting periods of relative isolation and of relative continuity of habitats (Graham 1993, Gentry 1995, Van der Hammen & Hooghiemstra 2001).

Common Bush-tanager *Chlorospingus ophthalmicus* is an emberizine finch (Yuri & Mindell 2002) that ranges from south and east Mexico south to Argentina in cloud forests and (to a limited extent) other humid montane forests (Isler & Isler 1987, Stotz *et al.* 1996; Fig. 1) and shrubbery (J. Fjeldså *in litt.* 2006). *C. ophthalmicus* has *c.*25 described subspecies, subdivided into eight morphotypes based on eye colour, presence of a pectoral band and of a postocular spot (Isler & Isler 1987). Only one such—the *ophthalmicus* group—occurs in Mesoamerica north of the Panamanian Isthmus, with as many as ten subspecies recognised, all with dark irides, a postocular spot and a pectoral band (Isler & Isler 1987; Fig. 1a).

Recent studies have demonstrated lack of gene flow amongst allopatric populations of this species using allozyme electrophoresis (Peterson *et al.* 1992) and mtDNA sequences (García-Moreno *et al.* 2004). The latter study addressed genetic differentiation amongst populations in Mexico and northern Central America. These works suggest that the 'species' is in fact a complex of species, an idea mentioned in several publications (Davis 1972, Howell & Webb 1995, Stotz *et al.* 1996, Navarro & Peterson 2004, García-Moreno *et al.* 2004). As no previous work has integrated views of morphological and genetic variation in clarifying species limits in the group, here we analyse geographic patterns of morphological variation in Mesoamerican *C. ophthalmicus* populations and compare these data with recent phylogenetic results (García-Moreno *et al.* 2004). The result is a reassessment of species limits in the group.

Methods

We measured and scored 355 adult specimens (233 males and 122 females) of *C. ophthalmicus* from Middle America. This material is deposited in the Instituto de Biología and Museo de Zoología of the Facultad de Ciencias, both Universidad Nacional Autónoma de México, Mexico City (UNAM), University of Kansas Museum of Natural History, Lawrence (KUNHM) and the Natural History Museum, Tring (NHM). Six morphometric characters and ten qualitative plumage coloration characters were analysed. Morphometric characters (abbreviations in parentheses) were: bill-length (BL), bill-width (BW) and bill-depth (BD; all three taken at the anterior edge of the nostril), wing-chord (WC), tail-length (TAIL) and tarsus-length to the lowest complete scute (TAR). Qualitative plumage characters scored were: the shape of the line in the forehead, crown colour, shape of the postocular stripe, throat colour, breast-band colour, throat pattern and presence of a whitish 'ear' and 'eyebrows' (see Appendix for details). All measurements were taken with digital çallipers to the nearest 0.01 mm.

For analyses of geographic variation, we selected ten operational geographical units (OGUs), considering cloud forest continuity and disjunctions in Mexico and northern Central America (i.e., south to Nicaragua; Fig. 1b). For comparison with

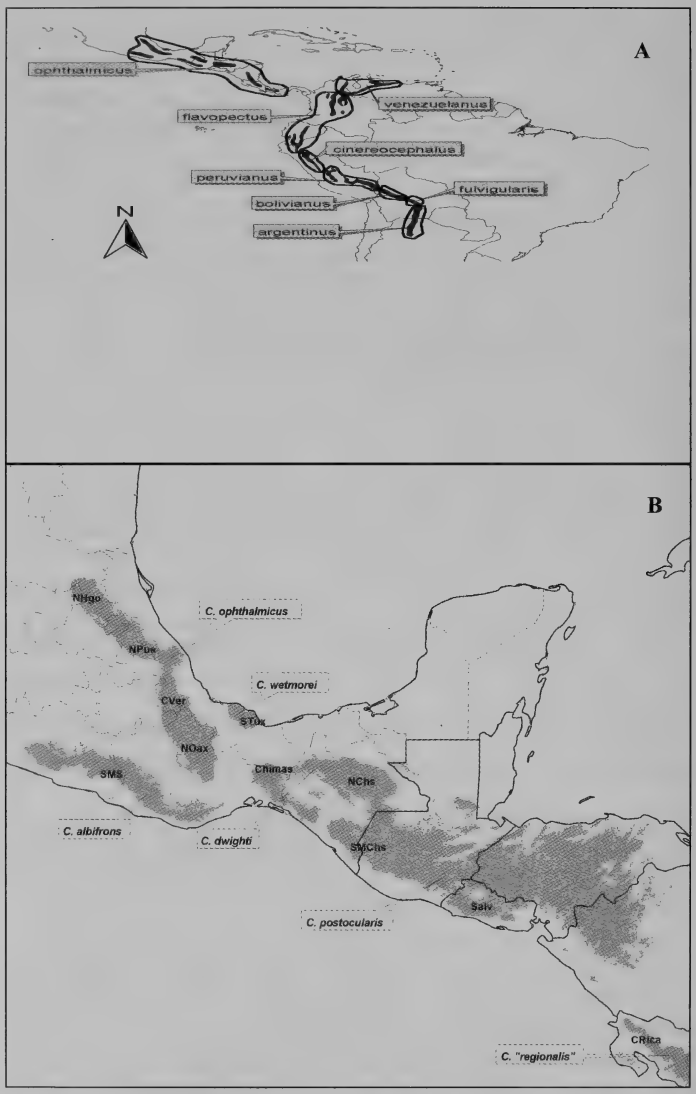

Figure 1a. Distribution of the *Chlorospingus ophthalmicus* complex showing the principal groups of Isler & Isler (1987); b: OGUs and proposed species taxa of *Chlorospingus ophthalmicus* in Mesoamerica. Acromyns for OGUs are as follows: NHgo (south-eastern San Luis Potosí to northern Hidalgo), NPue (north-easternmost Hidalgo to northern Puebla), CVer (central Veracruz to extreme northern Oaxaca), NOax (northern Oaxaca), SMS (Sierra Madre del Sur, Guerrero and Oaxaca), STux (Sierra de los Tuxtlas, southern Veracruz), Chimas (Chimalapas region, eastern Oaxaca), NChs (northern Chiapas), SMChs (Sierra Madre de Chiapas, Pacific slope of Chiapas and southern Guatemala), Salv (El Salvador), and CRica (Costa Rica).

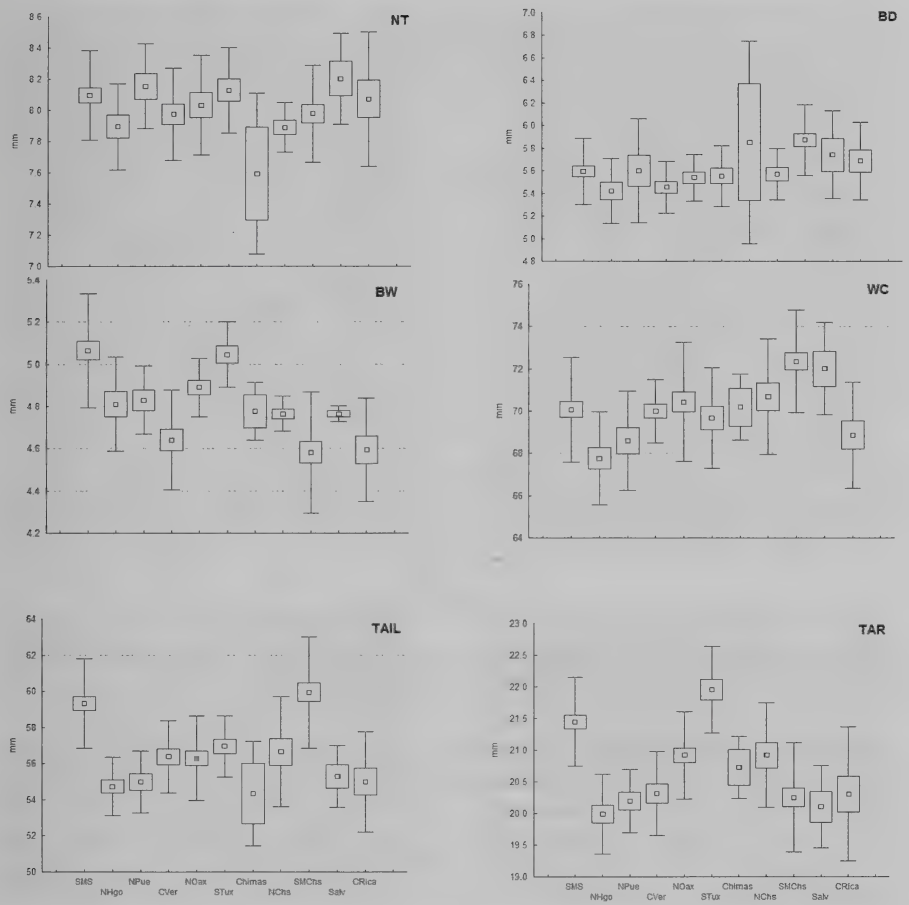

Figure 2. Variation in six morphometric characters. Shown are: means, standard errors (boxes) and standard deviations (whiskers). Characters depicted are: BL = bill-length from nostril; BD = bill-depth at nostril; BW = bill-width at nostril; WC = wing-chord; TAIL = tail-length; and TAR = tarsus-length. OGU acronyms refer to those used in Fig. 1b.

Chlorospingus populations further south, we included an additional OGU consisting of the subspecies *C. o. regionalis* (CRica), which occurs from northern Nicaragua to central Costa Rica; this OGU was chosen because of the large number of specimens available, and because it is the northernmost of the remaining populations. The geographic positions and abbreviations of OGUs are presented in Fig. 1b.

Morphometric characters were first evaluated using Pearson's product-moment correlations to detect redundant variables (Zink & Remsen 1986). Normality of

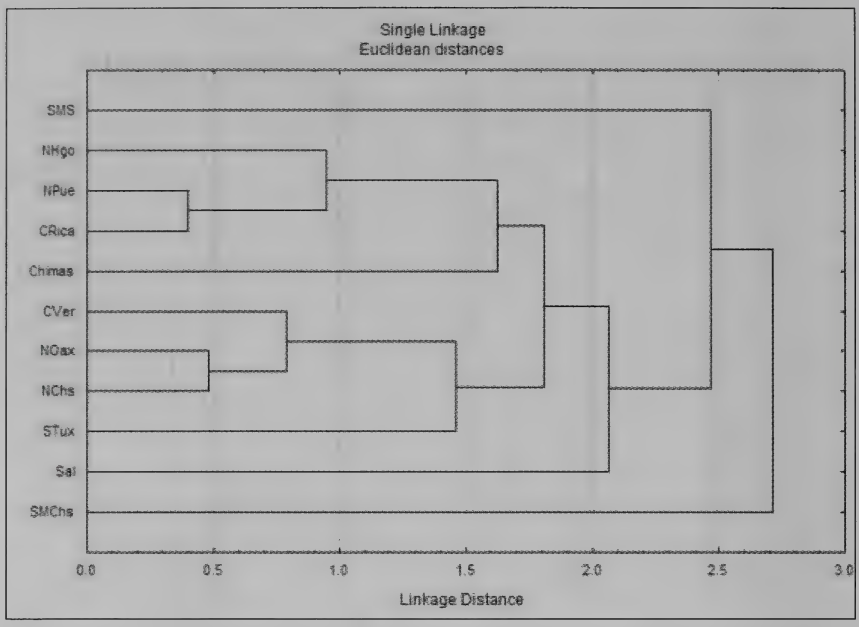

Figure 3. Phenogram (UPGMA) depicting patterns of overall similarity amongst populations of *C. ophthalmicus* in Mesoamerica. OGU acronyms refer to those used in Fig. 1b.

distributions of morphometric characters was tested for each OGU using Kolmogorov-Smirnov tests. Significance of differences amongst sexes was tested using univariate ANOVAs. To illustrate broad trends, we used centroids for each OGU (Crisci & López Armengol 1983, Zink & Remsen 1986)—we then used UPGMA cluster analysis (Sneath & Sokal 1973) in NTSyS (Rohlf 1992) to develop branching diagrams summarising overall similarity, and principal component analysis (PCA) to identify principal groupings (Johnson 1980, Crisci & López Armengol 1983). All statistical analyses were performed in STATISTICA V. 4.5. (Statsoft 1998), with a significance criterion of $\alpha = 0.05$.

Human-visible sexual dichromatism (Eaton 2005) is absent (Ridgway 1902, Graves 1985, Peterson & Chalif 1987) in this group, a conclusion supported by initial inspection of our data and specimens, which revealed no consistent sexual differences. As a result, we combined all data in analyses of coloration. Coloration characters were standardised via reference to Smithe (1975). Coloration characters were scored via use of a reference series of specimens to represent each character state (Appendix). Results were arranged geographically for easier detection of clinal variation and character discontinuities, and morphological results were compared with patterns detected in the analysis of DNA sequence data (García-Moreno *et al.* 2004).

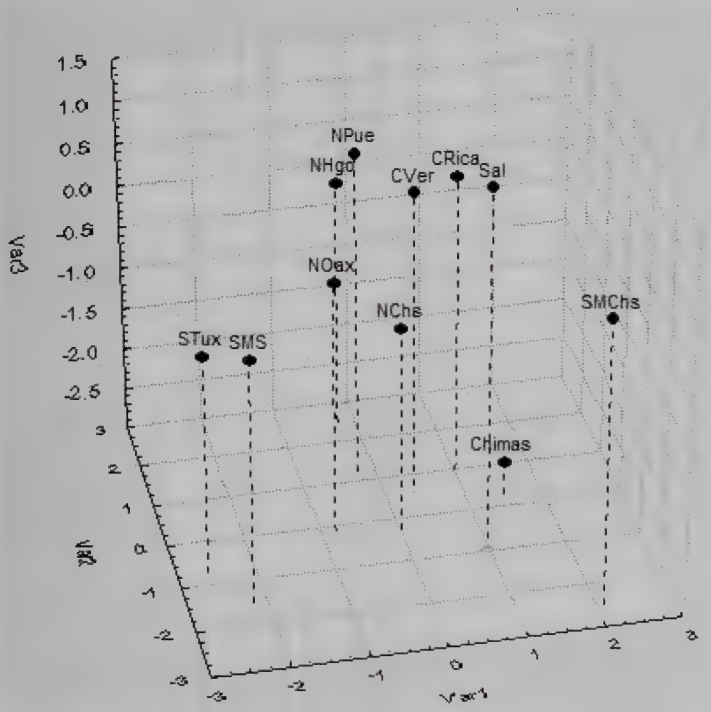

Figure 4. Principal Component Analysis of morphometric characters for the *C. ophthalmicus* complex in Mesoamerica. OGU acronyms refer to those used in Fig. 1b.

Results

Correlation coefficients indicated no redundancy between variables (highest r = 0.067), so all six morphometric characters were analysed. Kolmogorov-Smirnov tests revealed that all morphometric characters were normally distributed ($P<0.05$). ANOVAs indicated significant sexual dimorphism in size (males average larger) in all populations except STux ($P<0.05$), so all morphometric analyses were conducted for the two sexes separately. However, herein we present only results for males, given that results were similar for both sexes and that sample sizes were considerably smaller for females.

Morphometric characters that generally reflect body size (BL, WC, TAIL) showed clinal increases from north to south (Fig. 2), such as in populations from the Sierra Madre Oriental (NHgo increasing in size south to NOax). Individuals from western Mexican populations (SMS) were largest in several morphometric dimensions (BL, WC, TAIL). Although the general pattern within Mexico is of

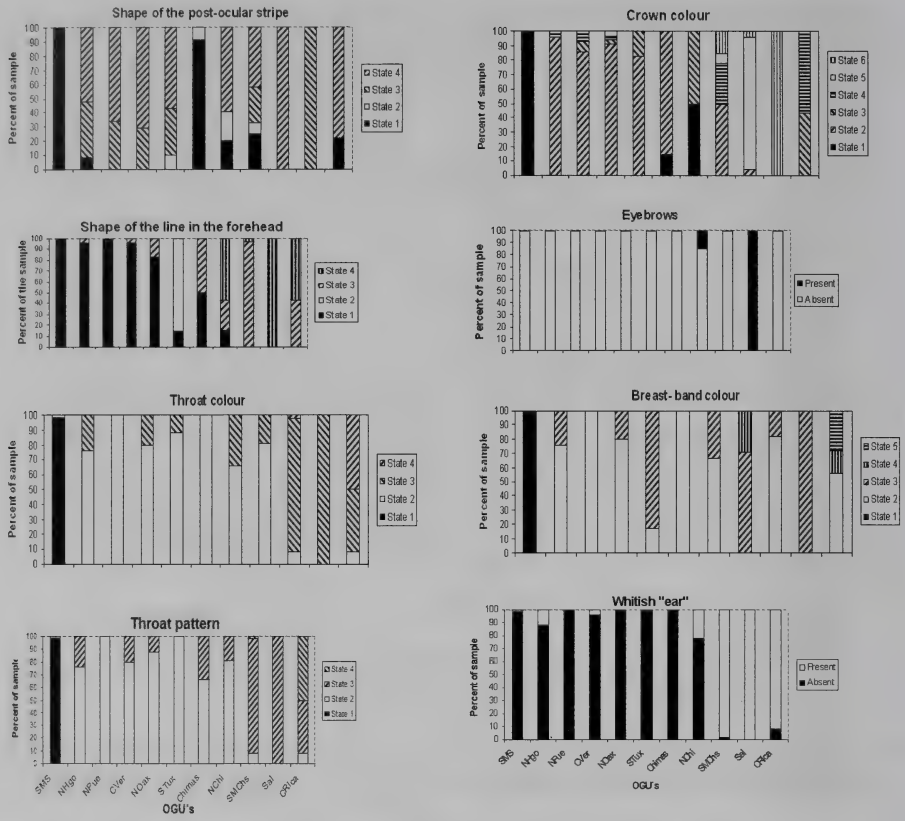

Figure 5. Frequencies of presence of coloration characters in the *Chlorospingus ophthalmicus* complex in Mesoamerica. OGU acronyms refer to those used in Fig. 1b.

increasing size southward, size decreases again in Central American populations (Fig. 2), making overall patterns more complex than simple clines.

Phenograms of morphometric characters revealed deep morphometric differentiation of SMChs from the remaining OGUs, which appear to cluster by size: smallest body size populations (NHgo, NPue, Chimas, and CRica) in one group, intermediate-size populations (STux, NOax) in a second, and largest-size populations (Sal, SMS; Fig. 3) being outgroups to the other clusters based on body size. PCA (Fig. 4) again indicated clear separation of the SMChs population; Sierra Madre Oriental populations formed a cline, with smaller populations (NHgo, NPue) in the upper part of the graph, increasing in size in CVer and NOax to Chimas, SMChs, STux and SMS, which were largest and distant from the rest of the OGUs in morphometric space.

TABLE 1
Factor loadings for the characters used in this study. Significant loadings are emboldened (>.700000).

Variable	Factor 1	Factor 2	Factor 3
BL	-0.462186	-0.064384	**0.730862**
BD	-0.344410	-0.579814	0.442335
BW	-0.555169	0.648783	0.209866
WC	-0.590800	-0.552444	-0.364449
TAIL	**-0.735521**	-0.184918	-0.376500
TAR	-0.605233	0.547992	-0.189034
Explained Variation	1.896790	1.400933	1.084174
Proportion of Total	0.316132	0.233489	0.180696

TABLE 2
Characters defining species within the *Chlorospingus ophthalmicus* complex. Colours are from Smithe (1975).

Taxon	Crown	Throat	Breast-band	Whitish 'ear'	Eye-brow	Postocular spot	Throat pattern	Forehead spots
C. postocularis	Sepia	Light	Spectrum yellow	Present	Thin	Behind the eye	Speckled, no whiskers	Absent
C. wetmorei	Olive	Intermediate	Spectrum yellow, Chatreuse	Absent	Thin	Longer, almost surrounding all the eye	Speckled, whiskers 'washed'	Elongated white V-shaped
C. albifrons	Cinnamon brown	Dark	Orange yellow	Absent	Thin	Teardrop-like, almost surrounding the eye	Conspicuous whiskers, only speckled laterally	Round white spots
C. dwighti	Olive	Light	Chatreuse, Olive Green	Absent	Thick	Longer, almost surrounding the eye	Speckled, whiskers 'washed'	Washed
C. ophthalmicus	Olive	Intermediate	Spectrum yellow, Chatreuse	Absent	Thin	Longer and thinner, almost surrounding all the eye	Speckled, whiskers 'washed'	Washed

Characters of plumage coloration showed diverse patterns of variation across geography (Fig. 5). Multiple characters revealed the discrete differentiation of SMS from other populations (throat pattern and colour, breast-band colour, head colour). Single characters showed discrete breaks at other points in the distribution of the group (e.g., 'ear' colour between Chimas and SMChs, shape of the postocular spot in STux). Still other characters showed frequency variation across Mesoamerica (e.g., throat and head colours).

Discussion

Like other bird species inhabiting fragmented biomes such as cloud forests (e.g., *Myioborus miniatus*, O'Neill 1982, Pérez-Emán 2005; *Aulacorhynchus prasinus*, Navarro *et al.* 2001), significant geographic variation was detected in morphology of *C. ophthalmicus* (Remsen 1984, Isler & Isler 1987), even on the restricted geographic scale of northern Middle America. That such dramatic and discrete variation is visible *within* just one of the eight morphological groups (Isler & Isler 1987) suggests variation across the entire range of the 'species' will be even more impressive.

Size differences observed in this study generally corresponded with known geographic barriers, especially lowland interruptions to mountain chains, which delimit distributions in many montane clades (Escalante *et al.* 1993, Peterson *et al.* 1999). In Mesoamerica, the principal barriers for montane species are the Isthmus of Tehuantepec and the Nicaragua Depression, as well as the drier highlands of interior Mexico. The fairly marked differentiation amongst major mountain masses north and west of the Isthmus of Tehuantepec suggest that the early interpretation of these barriers (Peterson *et al.* 1992) was correct. Similar size differences amongst isolated montane populations occur in other taxa, such as *Aulacorhynchus prasinus* (Navarro *et al.* 2001).

Geographic variation in coloration in Mesoamerican *Chlorospingus* shows a typical 'leapfrog' pattern (Remsen 1984), with several characters present in widely separated populations but not in intermediate populations (Fig. 5). Though this pattern has been explained as similar selection pressures in widely separated areas, resulting in similar expression of characters (Remsen 1984, Fjeldså & Krabbe 1990, García-Moreno & Fjeldså 2000), it might involve evolutionary differences related to individual and species recognition (Cracraft 1983, Johnson 2002), or could be a simple consequence of evolutionary changes in intermediate populations in strings of isolated insular populations.

Studies of mtDNA sequences of Mesoamerican *Chlorospingus* populations revealed extreme levels of genetic differentiation (García-Moreno *et al.* 2004), coinciding with our previous study (Peterson *et al.* 1992) which also identified strong differentiation amongst four populations based on allozyme loci. García-Moreno *et al.* (2004) documented five well-differentiated clades in Mexico, with a clear hierarchy of relationships and segregated by clear geographic boundaries. Each has apparently been isolated genetically for significant time periods. Discrete morphological breaks documented here coincide with the phylogenetic findings: the groups from the Sierra Madre del Sur (SMS) and Sierra Madre de Chiapas (SMChs) were recovered in both analyses. Although some of the OGUs, in the Sierra Madre Oriental, Los Tuxtlas (STux) and northern Central America, were combined in a single grouping owing to size similarities, these clearly separated in the phylogenetic study. The seemingly minor (but discrete) morphological breaks documented herein coincide closely with zones of significant genetic

differentiation, in this case associated with lowlands like the Isthmus of Tehuantepec, separating the northern forms *ophthalmicus* and *albifrons* from southern *postocularis* and *dwigthti*; and the Gulf slope, which separates Sierra Madre Oriental *ophthalmicus* from Los Tuxtlas *wetmorei*, or with unsuitable habitat in the Transvolcanic Belt, which separates Sierra Madre Oriental *ophthalmicus* from Sierra Madre del Sur *albifrons*. Therefore, the different *Chlorospingus* lineages in Mexico may represent species (Puorto *et al.* 2001, Helbig *et al.* 2002, Irwin 2002, Wiens & Penkrot 2002).

Species limits and taxonomy

Undoubtedly, one factor that has promoted diversification of *Chlorospingus* is its almost complete restriction to cloud forest, which has a patchy, discontinuous distribution (Fig. 1b). This geographic setting impedes gene flow between populations and has probably produced the long branches separating clades in the group (García-Moreno *et al.* 2004). The existence of marked genetic differentiation and multiple coincident morphological breaks suggests that species limits should be reassessed. Of course, genetic evidence should be used carefully when treating allopatric populations (Edwards *et al.* 2005), but this caveat should not be an excuse not to re-examine species limits in such taxa. In *Chlorospingus*, significant genetic differentiation coincides with morphometric differentiation and plumage coloration differences, at least demonstrating concordant signals amongst character sets. These data clearly indicate that the five Mexican *Chlorospingus* clades are clearly diagnosable and qualify as evolutionary or phylogenetic species (Wiley 1980, Cracraft 1983, Navarro & Peterson 2004, Watson 2005).

In general, variation in morphology and coloration was almost discrete and differences in character combinations amongst populations were abrupt. This situation avoids the problems of non-coincident variation patterns amongst character sets (Wiens & Penkrot 2002). Given the importance of plumage recognition in the breeding biology of birds and preliminary data concerning vocal variation amongst the same populations (Sosa-López 2004), we suggest these populations may also prove to be reproductively isolated and thus qualify as biological species as well. Hence, we suggest recognition of five allopatric species in northern Mesoamerica, as follows (see Fig. 6 and Table 2 for diagnostic characters). Common names are adapted from Ridgway (1902) and Winker *et al.* (1997).

Chlorospingus postocularis Cabanis, 1866. Dusky-headed Bush-tanager—extreme south-east Sierra Madre de Chiapas (Volcán Tacaná, probably west to El Triunfo) and mountains on the Pacific slope of Guatemala, Honduras, El Salvador and probably western Nicaragua. These populations form the deepest branch in the phylogeny of García-Moreno *et al.* (2004), and are also the most external clusters in our UPGMA and PCA results (Figs. 3–4). Individual samples are genetically relatively different from one another (García-Moreno *et al.* 2004) because they represent the extremes of the distribution of this form, and still

more distinct populations may be documented (García-Moreno *et al.* in prep). This zone of differentiation coincides with distributions of other species complexes (e.g. *Atlapetes albinucha* vs. *A. gutturalis* and *Basileuterus rufifrons* vs. *B. delattrii*), though no other complex has been studied using molecular characters. Besides the subspecies *postocularis*, this species includes populations usually assigned to the subspecies *honduratius* and *schistaceiceps*.

Chlorospingus wetmorei Lowery & Newman, 1949. Wetmore's Bush-tanager—montane forest and adjacent lowlands (Winker 1997) of the Sierra de los Tuxtlas, southern Veracruz. Its avifauna (and other components of its biota) represents an oft-neglected local focus of endemism (e.g. Winker 1997). This set of *Chlorospingus* populations is amongst the most genetically distinct in Mexico (García-Moreno *et al.* 2004). Other avian endemics in the region include *Buarremon* (*brunneinucha*) *apertus* (Peterson *et al.* 1992), *Campylopterus excellens* and *Geotrygon carrikeri* (Peterson 1993).

Chlorospingus albifrons Salvin & Godman, 1889. White-fronted Bush-tanager—Sierra Madre del Sur in Guerrero and Oaxaca (Sierra de Yucuñacua and Sierra de Miahuatlán; Binford 1989). Some Sierra Madre del Sur cloud forest islands may have been isolated for long periods and the molecular dataset suggests non-trivial differentiation of populations within this form (cf. *Eupherusa poliocerca* from Guerrero vs. *E. cyanophrys* from Sierra de Miahuatlán, which show such a pattern). However, more thorough sampling is required to assess the degree of genetic continuity in these populations (García-Moreno *et al.* in prep). This species includes populations in the Sierra de Miahuatlán, sometimes assigned to subspecies *persimilis* (Phillips 1966).

Chlorospingus dwighti Underdown, 1931. Dwight's Bush-tanager—montane northern Chiapas and extreme eastern Oaxaca (Chimalapas, *contra* Binford 1989) west to the Atlantic slope of Guatemala (Underdown 1931) and probably the western Sierra Madre de Chiapas.

Chlorospingus ophthalmicus (Du Bus, 1847). Brown-headed Bush-tanager—the Sierra Madre Oriental, from south-east San Luis Potosí south to northern Oaxaca. Specimens assigned to this form from extreme western Chiapas (Montserrate area, Miller *et al.* 1957) should be re-examined, but probably represent *C. dwighti*. Molecular studies (García-Moreno *et al.* 2004) suggest this clade may be further subdivided, with samples from northern Oaxaca vs. samples from further north (San Luis Potosí south to central Veracruz) forming distinct subclades, but further study involving more complete sampling of additional character sets is clearly needed (Sosa-López 2004).

Given that *C. ophthalmicus* under this taxonomy becomes endemic to Mesoamerica (type locality = Jalapa, Veracruz, Mexico), populations south of our study region remain to be analysed, afforded species limits and named correctly. For the present, the available name for southern Central and South American

populations with priority is *C. flavopectus* (Lafresnaye, 1840), which should be used preliminarily until the taxonomic status of southern forms is better defined.

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APPENDIX

Coloration character states and reference specimens used. Numbers in parentheses depict colour numbers as in Smithe (1975). Museum acronyms: Museo de Zoología de la Facultad de Ciencias, UNAM (MZFC); Natural History Museum, Tring, UK (NHM).

Crown colour

State 1.—Cinnamon Brown (33) MZFC 3975
State 2.—Olive Brown (28) MZFC 9715
State 3.—Olive (30) MZFC 12363
State 4.—Fuscous (21) MZFC 13112
State 5.—Sepia (119) MZFC 8802
State 6.—Neutral Gray (83) MZFC 7682

Shape of the line in the forehead

State 1.—Round white spots MZFC 3975
State 2.—Elongated V-shaped, white MZFC 7203
State 3.—Washed MZFC 8802
State 4.—Absent MZFC 9584

Shape of the postocular stripe
State 1.—'Teardrop' MZFC 3975
State 2.—Longer and thicker, almost surrounding the eye MZFC 9715
State 3.—Longer, almost surrounding the eye MZFC
State 4.—Only behind the eye MZFC 8802

Whitish 'ear'
Absent MZFC 9584
Present MZFC 3975

Throat colour
State 1.—Dark MZFC 3975
State 2.—Intermediate MZFC 7203
State 3.—Light MZFC 9584

Breast-band colour
State 1.—Orange yellow (18) MZFC 3975
State 2.—Spectrum yellow (55) MZFC 9749
State 3.—Chartreuse (158) MZFC 9576
State 4.—Olive Green (48) MZFC 9584
State 5.—Lime Green (59) + Spectrum Orange (17) NHM 85.6.8.21

Throat pattern
State 1.—Conspicuous whiskers, only laterally speckled MZFC 3975
State 2.—Speckled, whiskers 'washed' MZFC 9715
State 3.—Speckled, no whiskers MZFC 8802
State 4.—Conspicuous whiskers NHM 85.6.8.21

Head stripes
Thin blackish MZFC 8802
Thick, black NHM 98.12.14.573

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Nine bird species new to Bolivia and notes on other significant records

by J. A. Tobias & N. Seddon

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During field studies in 2001–05 we travelled widely in northern Bolivia, from the puna of Oruro to lowland rainforest of Pando, and compiled many ornithological records, some interesting from a national or biogeographical standpoint. These include the first Bolivian records of eight species (all of them documented): Wire-crested Thorntail *Discosura popelairii*, Green-tailed Goldenthroat *Polytmus theresiae*, Ocellated Woodcreeper *Xiphorhynchus ocellatus*, Chestnut-throated Spinetail *Synallaxis cherriei*, White-cheeked Tody-tyrant *Poecilotriccus albifacies*, Sulphur-rumped Flycatcher *Myiobius barbatus*, Citron-bellied Attila *Attila citriniventris* and Pale-bellied Mourner *Rhytipterna immunda.* We also report the first documented record of Ruby-topaz Hummingbird *Chrysolampis mosquitus*, previously known from three published reports, all either dubious or provisional. In addition, we include details of the first Bolivian records of Chimney Swift *Chaetura pelagica* (undocumented), and two taxa currently considered races of Fuscous Flycatcher *Cnemotriccus fuscatus*, namely *fuscatior* and *duidae*, both of which probably warrant recognition as separate species. In effect, therefore, this paper adds 12 new species to the avifauna of Bolivia.

During these surveys we recorded several other species known from very few previous records. Thus we report the second Bolivian localities for Uniform Crake *Amaurolimnas concolor*, Rufous-faced Crake *Laterallus xenopterus*, Collared Puffbird *Bucco capensis*, Parker's Spinetail *Cranioleuca vulpecula*, Brownish Elaenia *Elaenia pelzelni*, Pearly-breasted Conebill *Conirostrum margaritae* and Green Oropendola *Psarocolius viridis*; our sightings of Brownish Elaenia and Cerulean Warbler *Dendroica cerulea* were the first in Bolivia for over 60 years.

Although political boundaries have little biogeographical relevance, bird distributions in Bolivia have been expressed by department (dpto.) ever since an annotated avifaunal inventory was published by Remsen & Traylor (1989). This approach is useful because it produces finer detail and, as noted by Whitney *et al.* (1994), it provides an unparalleled basis for assessing the importance of new records, particularly as data are periodically updated, most recently by Hennessey *et*

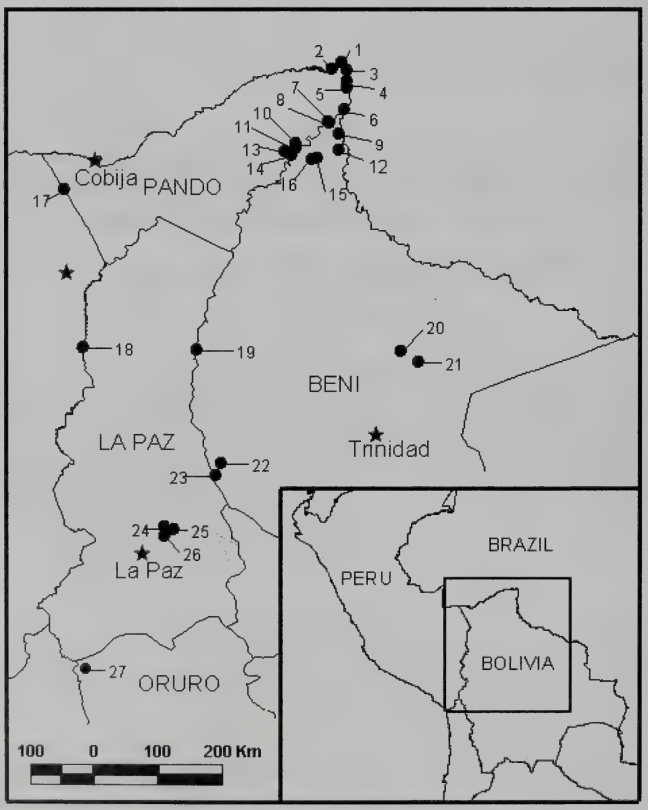

Figure 1. Map of relevant Bolivian departmental boundaries with survey sites, arranged from north to south and numbered as in the text.

al. (2003b). In line with this, we present 37 new departmental records (20 for Pando, four for La Paz and 13 for Beni). Expressing distributions by geopolitical unit is certainly valuable, but has a tendency either to over-emphasise minor range extensions or under-emphasise substantial ones, depending on the whereabouts of these artificial boundaries. For this reason, we include a few noteworthy sightings that do not represent new departmental records.

Photographic and video documentation of our records will be published separately, aside from four images included here as Figs. 2–5; sound-recordings have been archived at the Macaulay Library of Natural Sounds, Cornell University, USA. We use the sequence and taxonomy proposed by Remsen *et al.* (2005), except for Ocellated Woodcreeper, which we consider to be a separate species from Tschudi's Woodcreeper *X. chunchotambo,* following Marantz *et al.* (2003).

Habitats

Most of the terms we use are well known—seasonally flooded Amazonian forests associated with white-water systems are *várzea*, adjacent forests on uplands or terraces that never flood are *terra firme*, lowland grasslands with scattered shrubs and fire-resistant trees are *cerrado*, humid grasslands above the treeline are *páramo*, and dry bunchgrass on level plains at high altitude are *puna.* The term 'stunted forest,' however, requires clarification.

A variety of low-stature forests grow on infertile soils in lowland Bolivia, but the most typical form in dpto. Pando has been called 'dwarf hummock forest' (Montambault 2002) and *sartenejal* (Moskovits *et al.* 2003). Similar habitat lies across the río Madeira in Rondônia, Brazil, where it has been described as 'white-sand forest' or *campina* (Whittaker 2004). Rather than sandy substrates, the low-stature forests in Rondônia and Bolivia are usually associated with poorly drained weathered clays or with thin soils on ancient rock outcrops. Therefore, we avoid terms used to describe vegetation on different substrates elsewhere in the Neotropics (e.g. *varillal, campina, campinarana* or white-sand forest). We also avoid the local names *chaparral* and *sartenejal*, the former because it is elsewhere linked with dry thorny vegetation and the latter because it describes the ground layer and can equally be applied to poorly drained pampas vegetation. Given the range of low-stature forests in lowland Bolivia, we elect to use the general term 'stunted forest' as this describes the essential feature of the habitat and correctly implies that edaphic conditions impede vegetation growth.

We surveyed stunted forest in dptos. Beni and Pando, where it occurs in patches surrounded by well-drained *terra firme.* Typically, canopy height varies from 5 to 20 m, the understorey is relatively open and characterised by low ferns (*Trichomanes*) and varied melastomes (Melastomataceae), whilst the ground surface is spongy with a deep litter mat and patterned with a maze of raised bumps. Despite differences in underlying substrate, the overall vegetation structure means that Bolivian stunted forests support a range of bird species associated with similar

habitats throughout Amazonia (see Alonso & Whitney 2003). These include Brown-banded Puffbird *Notharchus ordii*, Bronzy Jacamar *Galbula leucogastra*, Zimmer's Tody-tyrant *Hemitriccus minimus*, Yellow-throated Flycatcher *Conopias parva*, Campinarana (or Varillal) Flycatcher *Cnemotriccus fuscatus duidae*, Black Manakin *Xenopipo atronitens* and Pale-bellied Mourner *Rhytipterna immunda*, most of which are poorly known in Bolivia. Otherwise, their richness in terms of species diversity is relatively low.

A different type of low-stature forest, which we term *Scleria* forest, occurs patchily near Manoa, in north-east Pando. This habitat is probably seasonally flooded, with a 15–20 m canopy and abundant vine-like razor-sedge (*Scleria:* Cyperaceae) in an otherwise open understorey (Moskovits *et al.* 2003). An equivalent semi-deciduous forest type, with a 15–30 m canopy, occurs in drier parts of northern dpto. Beni, where it is called *garrabatal. Scleria* appeared to be absent there and terrestrial bromeliads were present in patches. In general, Bolivian stunted forests and *Scleria* forests (but not *garrabatal*) appear to be associated with the Brazilian shield, a geological feature that extends marginally west of the río Madeira. Stunted forest of one type or another is extensive but virtually unexplored in north-east dpto. Pando (Moskovits *et al.* 2003), and similar habitats are found patchily further south in northern and eastern dpto. Beni, wherever the substrate is infertile or poorly drained. Further surveys will doubtless produce interesting ornithological records, but access is generally difficult.

Another suite of poorly surveyed habitats in Bolivia are those associated with river islands. We visited 11 islands of varying sizes and underlying geology, from Isla Valparaiso on the río Madre de Dios, downstream to the Falls of the Madeira. Islands upstream from Cachuela Esperanza are usually formed by accretion of midstream sediment or by new river channels severing the narrow neck of meanders. Islands further downstream, from Cachuela Esperanza to Manoa, tend to be formed around rocky intrusions associated with the Brazilian shield. The greater age and shallower substrate of these rocky islands means that they do not support the classic *Tessaria–Gynerium–Cecropia* succession of younger sediment-rich islands, instead being characterised by low tangled woodland. For this reason, and perhaps because they tend to be smaller, rocky islands seem almost bereft of birds considered to be river-island specialists (Rosenberg 1990). Indeed, the rocky islands and cataracts along a major non-navigable stretch of the ríos Madeira and Beni, from above Porto Velho to Cachuela Esperanza, may explain the absence of several river-island specialists in the upper Madeira system. Despite a concerted effort and use of playback at all suitable sites, we failed to encounter Zimmer's Woodcreeper *Xiphorhynchus kienerii*, Lesser Hornero *Furnarius minor*, Lesser Wagtail-tyrant *Stigmatura napensis* or Bicolored Conebill *Conirostrum bicolor*, and several other species known from insular or riverine habitats downstream. Some of these approach within 100 km of the Bolivian border (Cohn-Haft *et al.* 2005), and future surveys may well produce Bolivian records, but they appear to be rare in the region.

Survey sites

The following is a numbered list of Bolivian locality names mentioned in this paper and mapped in Fig. 1. Coordinates, given in degrees and decimal minutes, were read from a Garmin GPS 60, except where stated otherwise. Localities are arranged from north to south.

(1) **Manoa** (09°41'S, 65°24'W), 120 m above sea level, Pando, 27 April–2 May 2005. Coordinates were taken from a camp on the west bank of the río Madeira (Madera), *c.*3 km north of the existing Manoa military post and *c.*3 km south of the confluence with the río Abuna, at the north-east tip of Bolivia. We cut a trail west from the camp, passing through a strip of tall evergreen forest, followed by seasonally flooded riverine forest, then a large tract of lower stature *Scleria* forest. Moskovits *et al.* (2003) surveyed the same site in 2002 and provide a detailed habitat description.

(2) **Abuna** (09°47'S, 65°32'W), 120 m, Pando, 6–8 November 2006. Coordinates were taken at the manned military station roughly opposite the Brazilian town of Fortaleza da Abunã. We worked a trail along an old logging road heading south-east through well-drained humid *terra firme* on terraces away from the río Abuna. Canopy height was relatively low (15–30 m), suggesting low substrate fertility, but the habitat was structured like forests on more fertile soil in western Pando and southern Peru.

(3) **Dos de Junio** (09°48'S, 65°20'W), 120 m, Pando, 9 November 2005. Coordinates were taken *c.*2 km from the west bank of the río Madeira, at the edge of poorly drained stunted forest with a canopy of *c.*20 m.

(4) **Piedritas** (09°57'S, 65°20'W), 120 m, Pando, 3–7 May 2005 and 1–3 November 2005. This abandoned military camp stands on the west bank of the río Madeira. Trails inland passed through swampy habitats, tall *várzea* with abundant palms, and eventually reached extensive stunted forest with a 12-m canopy (our main survey plot in this habitat was at 09°57'S, 65°22'W). A more detailed habitat description was published by Moskovits *et al.* (2003).

(5) **Nueva Esperanza** (10°03'S, 65°19'W: coordinates from Moskovits *et al.* 2003). A village close to the west bank of the río Madeira, opposite the town of Araras, Rondônia, Brazil. Scrubby habitats at the periphery of the village were surveyed on 30 October and 5 November 2005.

(6) **Falls of the Madeira** (10°21'S, 65°22'W), 150 m, Pando, 26–29 October 2005. We surveyed four islands between 50 and 1,000 m long, within an archipelago of dozens of rocky islets associated with the Falls of the Madeira, a series of small cataracts situated where the ríos Beni and Mamoré join to form the río Madeira. This

locality has received no ornithological attention since being surveyed briefly by the botanist H. H. Rusby in the late 19th century (Allen 1889).

(7) **Los Indios** (10°32'S, 65°35'W), 150 m, Pando, 11–13 May 2005 and 6–23 October 2005. Coordinates were taken at the north bank of the río Beni, at the start of the road to a major sawmill (Los Indios, in a large concession of the same name), *c.*10 km to the north. Roads continue north and east to the río Negro and Nueva Esperanza. A Conservation International Rapid Assessment Program (RAP) team surveyed the region of San Juan de Nuevo Mundo (10°46'S, 66°44'W), at the headwaters of the río Negro and *c.*40 km north of the río Beni, for *c.*5 days in July 1992 (Montambault 2002). The only other recent work in the region was conducted by Moskovits *et al.* (2003) who visited Campamento Caimán (10°13'S, 65°22'W), near the río Madeira, for a similar period. Aside of these visits, the southern sector of dpto. Pando remains inadequately surveyed.

(8) **Cachuela Esperanza** (10°32'S, 65°34'W), 150 m, Beni, 9–13 May 2005. This old rubber-trading settlement stands roughly opposite the Los Indios road, on the south bank of the río Beni, adjacent to a non-navigable cataract. The surrounding habitat consists of selectively logged evergreen forest, most of it highly disturbed, and small patches of grassland. In 1937 this site was visited by A. M. Olalla (Gyldenstolpe 1945), although he and his collectors appear to have ignored the opposite bank in dpto. Pando.

(9) **Guayaramerin** (site A) (10°41'S, 65°26'W), 150 m, Beni, 25–26 April and 15 October 2005. This area of open *cerrado* and adjacent stunted forest (canopy 7–15 m) lies *c.*30 km north of Guayaramerin on the road to Cachuela Esperanza, and a few km south of the río Yata barge-crossing.

(10) **Isla Boca Orthon** (10°49'S, 66°01'W), 150 m, Pando, 13 November 2005. This small island lies at the mouth of the río Orthon. Mature forest covers the northern half, with early successional vegetation at the more disturbed southern end, including mixed age-classes of *Gynerium* cane and *Tessaria* shrubs.

(11) **Isla Riberalta** (10°53'S, 66°02'W), 150 m, Pando/Beni, 14 November 2005. This large, unnamed island is roughly circular and 1–2 km in diameter. It is the first major island downstream of Riberalta, and being midstream in the río Beni is shared between dptos. Pando and Beni. Much of the surface area supports a pure stand of *Cecropia* (10–30 m canopy), with a few other tree species admixed on the eastern shore; this woodland lacks a midstorey and the understorey is mostly low and tangled, with vines predominating, suggesting brief but annual inundation. The disturbed fringe, at least on the southern and western shores, is characterised by extensive mixed-age *Tessaria* and other pioneer species.

(12) **Guayaramerin** (site B) (10°55'S, 65°26'W), 150 m, Beni, 22 and 25 April and 1–3 October 2005. A small area of disturbed grassland and larger area of stunted forest (canopy 5–15 m) *c.*16 km west of Guayaramerin on the main highway to Riberalta. Habitat in this part of dpto. Beni seems roughly equivalent to the *sartenejales* of north-east dpto. Pando described by Moskovits *et al.* (2003), though the ground is broken by what looked like loose volcanogenic deposits, apparently iron ore, suggesting a different geological history.

(13) **Isla Valparaiso** (10°56'S, 66°11'W: read from 1:250,000 map SC19–12 Riberalta), 150 m, Pando, 19 and 21 October 2003. This slender island in the río Madre de Dios is a few km upstream of the confluence with the río Beni, and is the first permanent island met by upstream traffic from Riberalta. Most of the surface area supports a monoculture of *Cecropia* (20–30 m canopy), whilst the northern tip is more disturbed, characterised by lower trees, shrubs, creepers and *Gynerium* cane.

(14) **Boca Madre de Dios** (10°59'S, 66°05'W), 150 m, Pando, 18 and 21 October 2003 and 13–14 May 2005. This large unnamed peninsula, formed by the confluence of the ríos Madre de Dios and Beni, is probably isolated when the rivers are in spate, and, like a new or highly disturbed Amazonian river island, supports abundant *Tessaria,* including a dense marginal growth of young saplings (1–4 m canopy) and larger areas of scattered trees (*c.*5–12 m canopy). A few low *Cecropia* trees (5–12 m canopy) grow on the south side, whilst rough grassland and wetland dominate the east side. In the dry season (April–October) retreating waters expose large sandy beaches on the north shore. The site is a few km downstream of Victoria, río Beni, a collecting locality visited by A. M. Olalla in 1937 (Gyldenstolpe 1945).

(15) **San Lorenzo de Pampa** (11°01'S, 65°44'W), 150 m, Beni, 18 October 2003 and 12 November 2005. Coordinates were taken at the start of an unsurfaced road which cuts south from the main Riberalta–Guayaramerin highway, *c.*36 km from Riberalta, to a settlement named San Lorenzo de Pampa. The habitat immediately south of the junction consists of *cerrado* with scattered tall trees and low shrubs, surrounded by tall evergreen forest. Patches of similar habitat lie to the south, but these were not visited.

(16) **Riberalta** (km 27E) (11°02'S, 65°49'W), 150 m, Beni, 16 October 2003. This waypoint marks the beginning of a narrow track which leaves the main Riberalta–Guayaramerin highway, *c.*27 km from the central plaza in Riberalta, and runs south for several km through selectively logged evergreen forest with a canopy of 25–35 m. Riberalta itself, and the opposite bank in Pando, were worked by A. M. Olalla in 1937 (Gyldenstolpe 1945), and the area has been visited by several observers since the mid 1990s.

(17) **Extrema** (11°28'S, 69°15'W), 250 m, Pando, 7–11 November 2004. This military outpost is situated on the río Tahuamanu where it flows into Bolivia. It is reached via a newly constructed road linking Cobija (the capital of Pando) and San Lorenzo, a small village between Puerto Maldonado and Iñapari, dpto. Madre de Dios, Peru. Habitat in the immediate vicinity is highly disturbed, with an open canopy and much bamboo (*Guadua* sp.). Further afield there were large areas of tall *terra firme* lacking bamboo, but this was being cleared to make way for agricultural smallholdings (*chakras*) along the new road.

(18) **Alto Madidi** (13°40'S, 69°00'W: coordinates from Parker *et al.* [1991]), La Paz, 1–7 December 2001. We surveyed the vicinity of the Alto Madidi guard post on the upper río Madidi (previously a logging camp and high-security prison). We also worked a path between here and another guard post, named Candelaria, on the road to Ixiamas. A full habitat description is presented by Parker & Bailey (1991).

(19) **San Marcos** (13°42'S, 67°25'W: coordinates taken on the banks of the río Negro [A. B. Hennessey *in litt.* 2006]), 200 m, Beni, 1–3 September 2005. JAT and J. del Hoyo surveyed a trail from the south bank of the río Beni at San Marcos Viejo to the río Negro, several hours walk. The trail begins and ends in tall riverine forest, but passes through some tracts of lower stature semi-deciduous forest rich in vines and terrestrial bromeliads, a habitat known locally as *garrabatal.*

(20) **Estancia Cristalino** (13°43'S, 64°34'W), Beni, 200 m, 9–10 November 2003. Coordinates were taken at Isla Senisa, a site 3–4 km distant (Tobias 2003). Habitat is open *cerrado* interspersed with large areas of marsh and scattered islands of humid forest.

(21) **Paraparau** (13°52'S, 64°19'W), near the río Negro, 200 m, Beni, 3–13 November 2003. Coordinates were taken at an estancia in a raised forest island surrounded by extensive seasonally flooded meadows and grasslands.

(22) **Pilon** (15°16'S, 67°04'W), 900 m, Beni, 28–30 March 2005. This village is near the summit of the first low ridge of the Andes in a region characterised by linear north–south synclines. Despite its low altitude, the Pilon ridge captures high rainfall and habitat is consequently lush and epiphyte-laden near the summit. There have been several surveys of this and adjacent higher ridges in recent decades (Schmitt & Schmitt 1987, Parker 1989, Parker *et al.* 1991, Hennessey *et al.* 2003a).

(23) **Illampu** (15°26'S, 67°08'W), 1,350 m, La Paz, 26–30 March 2005. We surveyed a 2-km trail cut through ridgetop forest in the Serranía de Marimonos, near the village of Illampu. Some original forest remains on steeper slopes, but most habitat is highly degraded, dominated in some areas by a tall *Guadua* bamboo and in others by low-stature shrubby regrowth (canopy 2–5 m) with scattered mature trees (canopy 25 m). We also surveyed humid forest at 1,000 m, below Illampu.

(24) **Tunquini** (16°10'S, 67°52'W: coordinates supplied by S. K. Herzog *in litt.* 2005), 1,500 m, La Paz, 4–8 February 2005. A research station (now defunct) in the province of Nor Yungas, accessible from the new road linking La Paz and Coroico. Below 1,500 m habitat consists of steep patches of relatively dry forest interspersed with landslides and agricultural smallholdings. Above 1,500 m it is relatively humid and intact to the elfin forest–*páramo* ecotone and beyond.

(25) **Coroico** (16°11'S, 67°43'W), 1,800 m, La Paz, various dates, 2001–05. Remnant patches of cloud forest on the slopes of Cerro Uchumachi above and to the south of town. These are more or less contiguous with a larger area of habitat at the south end of the ridge.

(26) **Cotapata** (16°17'S, 67°51'W), 3,100 m, La Paz, various dates, 2001–05. Cloud forest extends along the upper reaches of the La Paz–Coroico road, but is generally difficult to access. One well-known entry point is the 'Cotapata Trail,' which begins at Cotapata petrol station, runs over a low ridge, then steeply downhill to an active mine. The site and its avifauna were described by Remsen (1985).

(27) **Sajama** (18°08'S, 68°58'W), 4,100 m, Oruro, 7–10 December 2005. A village in Sajama National Park in far western Bolivia, adjacent to Lauca National Park in Chile. Surrounding habitat includes extensive bunchgrass *puna* and rocky slopes with scattered *Polylepis tarapacana* trees.

Species accounts

LONG-WINGED HARRIER *Circus buffoni*
A dark-phase individual was photographed at Boca Madre de Dios on 18 and 21 October 2003. It spent much time hunting over grassy seasonal beaches beside the río Madre de Dios. This is the first documented record for dpto. Pando. It may have involved a wanderer from the breeding range in the Llanos do Moxos and associated grasslands of dpto. Beni, or the bird may have been an austral migrant from further south in Bolivia or even Argentina. The record fits a growing pattern of extralimital records in the austral winter from sites such as the isolated grasslands of the Pampas del Heath (e.g. Montambault 2002), the río Madre de Dios, Peru (T. S. Schulenberg *in litt.* 2006), and Rondônia, Brazil, where the first record for the state, and for Amazonian Brazil, involved a single (also a dark phase) at Palafitas Island in July 2002 (Whittaker 2004). Given the dispersive tendencies of the species, a Pando record was to be expected and it may be a regular non-breeding visitor to the poorly surveyed grasslands of south-central Pando (Alverson 2003).

WHITE-BROWED HAWK *Leucopternis kuhli*
An adult heard at Riberalta (km 27E) and then seen in flight was the first record for dpto. Beni, though there is an unconfirmed report from Antofagasta, also east of

Figure 2. Adult male Ruby-topaz Hummingbird *Chrysolampis mosquitus*, trapped near Guayaramerin, dpto. Beni, Bolivia, April 2005 (J. A. Tobias)

Figure 3. Ocellated Woodcreeper *Xiphorhynchus ocellatus perplexus*, Manoa, dpto. Pando, Bolivia, May 2005 (J. A. Tobias)

Figure 4. Chestnut-throated Spinetail *Synallaxis cherriei*, Extrema, dpto. Pando, Bolivia, November 2004 (J. A. Tobias)

Figure 5. White-cheeked Tody-tyrant *Poecilotriccus albifacies*, Extrema, dpto. Pando, Bolivia, November 2004 (J. A. Tobias)

Riberalta, in July 1997 (J. Hornbuckle *in litt.* 2004). Slightly further downstream, 2–3 were tape-recorded and photographed in May and October 2005, within 2 km of the north bank of the río Beni at Los Indios, dpto. Pando. Our records confirm that this hawk occurs on both banks of the río Beni, suggesting that it is distributed thinly but continuously from the lowlands of dpto. La Paz (Hennessey *et al.* 2003b) and northern dpto. Pando (Parker & Remsen 1987), through the extensive humid forests of northern and eastern dpto. Beni, to eastern Santa Cruz, where it occurs in Noel Kempff Mercado National Park (Killeen & Schulenberg 1998). Like many inconspicuous forest raptors, the species is much more easily detected by voice. The main advertising-call, often given in a well-spaced series, is a shrill, emphatic descending whistle; contact-calls are shorter, weaker versions of the same.

UNIFORM CRAKE *Amaurolimnas concolor*
In December 2001, at least two vocalised shortly before nightfall at Alto Madidi, *c.*100 m from the río Madidi, in dense, low-stature seasonally flooded forest. The song was tape-recorded and the birds observed in the open following playback. The only previous record for Bolivia involves a bird tape-recorded near Buena Vista, dpto. Santa Cruz, in December 1994 (Mayer 2000). Our record is thus the first for both dpto. La Paz and Madidi National Park, where predicted by Remsen & Parker (1995). The only previous record of a large dark rallid at the Alto Madidi site involved Blackish Rail *Pardirallus nigricans* (Parker & Bailey 1991), which is more often associated with low rank vegetation around Amazonian wetlands. Vocalisations of the two species are quite similar in tone but very different in pattern.

CHESTNUT-HEADED CRAKE *Anurolimnas castaneiceps*
A single sound-recorded at Los Indios on 10–11 May 2005 was only the fifth record for Bolivia. It was calling from within dense undergrowth of selectively logged forest, in a slightly damp depression with abundant palms and *Heliconia.* In Bolivia, the species was first recorded around Cobija (Parker & Remsen 1987), then at Puesto Militar Abuna, opposite the Brazilian town of Fortaleza, on the río Abuna (Montambault 2002); we tape-recorded one at the same locality in November 2005. It has also been recorded at Piedritas and Campamento Caimán near the río Madeira (Moskovits *et al.* 2003). Though the current record also is in dpto. Pando, it extends the known range south to the north bank of the río Beni and suggests that the species should be searched for in northern dpto. Beni.

RUSSET-CROWNED CRAKE *Anurolimnas viridis*
At least two were heard in low brushy regrowth and associated grassland near Nueva Esperanza at dusk on 30 October 2005, and were tape-recorded and photographed there on 5 November 2005. Three more were heard in similar habitat by the airstrip of Puesto Militar Abuna, in November 2005. These are the first and second records for dpto. Pando, but it appears to be *the* common crake in young successional vegetation, with or without standing water, in eastern Beni and Pando;

it was certainly so around Cachuela Esperanza and Guayaramerin, dpto. Beni. We include this form in *Anurolimnas* with reservations because its vocalisations appear much closer to *Laterallus* (Ridgely & Greenfield 2001).

RUFOUS-FACED CRAKE *Laterallus xenopterus*
A pair was seen well in flight at Estancia Cristalino, near the río Negro, dpto. Beni, on 9 November 2003. They were flushed from a small grassy marsh, with a water depth of *c.*3 cm and a sward height of *c.*30 cm, between Isla Senisa and Estancia Cristalino, and flew with typically slow progress across the marsh, permitting several distinctive features to be seen. Foremost were the chunky head and bill, the black upperwings boldly striped white and rufous nape contrasting with the mantle. During field work in this area and in flooded grasslands around Paraparau, several more crakes were heard or flushed, but all showed characteristics of the similar Rufous-sided Crake *L. melanophaius.* This is the second Bolivian record (both are from dpto. Beni) and its presence in the río Negro catchment fulfils the prediction of Brace *et al.* (1998) that the species is probably more widespread in the Beni *llanos* than records suggest. Given its threat status (Vulnerable), *xenopterus* should be searched for in suitable habitat throughout lowland dptos. Beni and Santa Cruz.

LEAST SANDPIPER *Calidris minutilla*
On 1 September 2005, JAT and J. del Hoyo observed large numbers of Nearctic shorebirds foraging along the río Beni between Rurrenabaque (14°30'S, 67°32'W) and San Marcos. The most common species were Pectoral Sandpiper *Calidris melanotos*, White-rumped Sandpiper *C. fuscicollis*, Lesser Yellowlegs *Tringa flavipes* and Greater Yellowlegs *T. melanoleuca.* We could not check these shorebirds carefully but, once, *c.*2 hours downstream of Rurrenabaque we made a detour to the north bank to identify a small group of *Calidris.* Three of these were Least Sandpipers, easily identified by their small size, dark upperparts, short decurved bills and pale off-yellow legs. This record, the first for dpto. La Paz, was expected given the scatter of Bolivian records during passage periods: there are *c.*8 previous records for the country, including one from a locality downstream on the río Beni (Gyldenstolpe 1945) and another in December 1976 from near the río Yata (Remsen 1986).

BLUE-HEADED MACAW *Primolius couloni*
There are several records of this species from dpto. Pando, where it is known from the Cobija region at Porvenir, Filadelfia and Camino Mucden (Parker & Remsen 1987), and from further west at Ingavi, on the río Orthon, and opposite Fortaleza on the río Abuna (Montambault 2002), as well as at Manoa, on the río Madeira (Moskovits *et al.* 2003). Elsewhere, the only previously published Bolivian records are from dpto. La Paz, where this macaw is known from the lower río Heath (Parker & Bailey 1991), the río San Antonio (M. Kessler *in litt.* 2006), and 2–8 km north of Rurrenabaque (Parker *et al.* 1991).

We found it fairly common around Extrema, dpto. Pando, where we encountered *c.*10 in three days, all in flight, making the species amongst the most frequently detected parrots in the area. It was not reported during recent field work a little way downstream along the río Tahuamanu (Alverson *et al.* 2000). We observed a pair fly across the río Madeira from Manoa, entering Brazil near the town of Abunã. This appears to be the first record for Rondônia (A. Whittaker *in litt.* 2005). Elsewhere, we sound-recorded a pair flying over extensive humid forest interspersed with small patches of *cerrado* at Guayaramerin (site A), on 26 April 2005, and watched six fly over Cachuela Esperanza, on 11 May 2005. These constitute the first records for dpto. Beni. Interestingly, we spent over two weeks at Cachuela Esperanza in October 2005 and failed to note the species, suggesting that it is either rare or sporadic in this region.

A range extension for Blue-headed Macaw is of interest given that its conservation status has recently been classified as Endangered (BirdLife International 2005). Our records indicate that it occurs along the lower río Beni, and across into dpto. Beni around Guayaramerin, at least occasionally. Future field work in the extensive forests of the río Yata drainage and in humid forest further upstream along the río Mamoré may find it even more widespread. Given the significance of these records, a note on identification is appropriate, especially as this macaw is usually encountered in distant flight and thus can be difficult to recognise using visual cues alone. Its two types of call, an oddly nasal disyllable and a soft rolling squawk, are, however, both instantly recognisable at long range. By virtue of its tone and the rolling 'r' sound which predominates, the main flight-call is distinctive. The only confusion species are its two congeners, Yellow-collared Macaw *P. auricollis* and Blue-winged Macaw *P. maracana*, both of which could occur in northern dpto. Beni—*auricollis*, a smaller bird, is fairly common in the *llanos* area to the south, and *maracana* has been recorded close to Bolivia in the *cerrado* of Mato Grosso, western Brazil. Their flight-calls are distinctly higher pitched than those of *couloni* and the rolling effect is slightly reduced, features which can be heard on commercial collections (e.g. Whitney *et al.* 2002). Given reasonable views, *P. couloni* can also be separated by the lack of a bare whitish ocular patch.

AMAZONIAN PARROTLET *Nannopsittaca dachilleae*

We observed a group of five flying over patchy roadside *Guadua* bamboo, near the río Tahuamanu, at Extrema, dpto. Pando, in November 2004. The sighting was too brief to take sound-recordings or photographs, but the following diagnostic characters were noted; the slightly elongated body, blunt wedge-shaped tail, and distinctive upwardly inflected, almost disyllabic flight-notes. The only possible confusion species here, Dusky-billed Parrotlet *Forpus sclateri,* was also present at the site, but easily distinguished by its smaller size, shorter tail, and weaker, more even-pitched flight-notes. An association with *Guadua* bamboo, especially along small rivers, has been noted previously (O'Neill *et al.* 1991) and is obvious at sites such as Estación Biológica Cocha Cashu and Boca Los Amigos, Madre de Dios,

Peru, where we have much experience of the species. There are several previous records for dpto. La Paz, including the first for Bolivia at Alto Madidi in 1990 (Parker & Bailey 1991), and repeated sightings from the río Heath, around Enahuipa and Puerto Moscoso, near the Pampas del Heath (O'Neill *et al.* 1991, Montambault 2002). Our record is the first for dpto. Pando. The species occurs in adjacent dpto. Madre de Dios, Peru, where seen recently at Noaya, *c.*50 km north-west of Extrema, in November 2005 (D. F. Lane *in litt.* 2005).

COMMON NIGHTHAWK *Chordeiles minor*

Sight records were reported by Pearson (1975) and, tentatively, by Dott (1985), but the species was not included on subsequent inventories of Bolivian avifauna because of the possibility of misidentification (Remsen & Traylor 1989). More recently, Common Nighthawk was found fairly commonly during passage periods at Noel Kempff Mercado National Park, with records from the 1980s (Killeen & Schulenberg 1998), in 1995 (D. Stotz & T. S. Schulenberg *in litt.* 2004) and October–November 2002 (JAT). Given acceptance of these sight records by Hennessey *et al.* (2003b), we report the following observations with some notes on identification.

Three large *Chordeiles* flew high over Boca Madre de Dios, dpto. Pando, heading south in a tightly knit group, 30 minutes before dark, on 18 October 2003. Similarly, a group of four nighthawks was seen flying south high over Los Indios, dpto. Pando, 30 minutes before dark, on 5 October 2005. As Least Nighthawk *C. pusillus* is a much smaller resident of *cerrado* habitats, with shorter wings and tail, the only serious identification pitfall is Lesser Nighthawk *C. acutipennis.* Aside of the high, direct and purposeful flight and their emergence long before dark, our birds were identifiable as *C. minor* by their relatively heavy build and long, sharply tapered wings with broad, conspicuous white patches in the primaries. In contrast, *C. acutipennis* is slighter, with a more fluttering flight and slightly blunter wingtips; it also tends to emerge closer to dusk and rarely flies high above the ground in flocks.

These, the first records of *C. minor* for dpto. Pando, were expected given that the species is known over much of eastern Peru on migration (T. S. Schulenberg *in litt.* 2005), and winters south to Argentina (Mazar Barnett & Pearman 2001).

WHITE-COLLARED SWIFT *Streptoprocne zonaris*

A strong cold front from the south arrived at Extrema, dpto. Pando, on 7 November 2004. In its wake, and as heavy rain enveloped the Andean chain, thousands of swifts fed over lowland Amazonian forest far from the foothills. The bulk of these were *Chaetura* swifts of at least four species, with small numbers of larger swifts. Of these latter, *c.*20 individuals that were identified were all White-collared Swifts, (adults and juveniles). According to Hennessey *et al.* (2003b) this is the first record of this easily identified species for Pando.

CHIMNEY SWIFT *Chaetura pelagica*

The large flock of swifts seen at Extrema, dpto. Pando, on 8–9 November 2004, included many Grey-rumped Swifts *Chaetura cinereiventris* and smaller numbers of Short-tailed *C. brachyura* and Pale-rumped Swifts *C. egregia.* Careful searching resulted in prolonged views of 2–3 distinctly larger *Chaetura* with a much stronger, less fluttering flight. We realised these were either Amazonian *C. viridipennis*, Sick's *C. meridionalis* or Chimney Swifts, which are structurally similar, and identified them as *pelagica* using a combination of features. Their upperparts were dark, only slightly paler on the rump, uppertail-coverts and lower back, and their throats were distinctly pale, creating a capped impression, and blending gradually with the rest of the underparts, which were mid brown, darkening towards the tail. Sick's Swift—which seems unlikely in this region in November because its breeding range lies further south—has a better defined and more restricted pale throat, pale undertail-coverts (noticeable in good light) and a paler rump and uppertail-coverts. We have little field experience with Amazonian Swift, but examination of specimens at the Natural History Museum (Tring) indicates that this form lacks a contrastingly pale throat, certainly insufficient to afford a capped impression, and that the rump and uppertail-coverts are noticeably paler.

In addition, we observed two large *Chaetura* in excellent light at Candelaria, near Alto Madidi, dpto. La Paz, in December 2001. We are almost certain these were also Chimney Swifts, but as our observation was brief the species cannot yet be added to the list of birds occurring in dpto. La Paz and Madidi National Park.

Our record from Extrema is the first of this long-distance Nearctic migrant for Bolivia. We treat the sighting as confirmed despite the lack of a photograph or specimen, because 1) it was made under ideal conditions, 2) our description is consistent with known field characters, and 3) the species was to be expected in Bolivia. Peruvian records span the Amazonian lowlands from Loreto in the north to Madre de Dios in the south (T. S. Schulenberg *in litt.* 2005), and a large proportion of the population is thought to winter in western Amazonia (Parker *et al.* 1982). In Brazil it is rare throughout much of Amazonia, but flocks of hundreds have been seen in Acre, not far north of Bolivia (Whittaker & Oren 1999). As further corroboration, the species was identified in November 2005 amongst swifts near Puerto Maldonado, Madre de Dios, Peru, *c.*120 km due south of Extrema (D. F. Lane *in litt.* 2005). Its occurrence in north Bolivia is therefore expected, and further work at suitable seasons will probably reveal the species to be a regular visitor.

RUBY-TOPAZ HUMMINGBIRD *Chrysolampis mosquitus*

In April 2005, we found this spectacular hummingbird in the shrubby borders of grassland and low stunted forest at Guayaramerin (site B), dpto. Beni. A female was photographed in the field, and another was mist-netted and photographed along with two adult males (Fig. 2). During intensive field work, the only other hummingbird detected at this site was Green-tailed Goldenthroat *Polytmus theresiae*; both were very common. Interestingly, the goldenthroat was still abundant and conspicuous in

October 2005, whereas the *Chrysolampis* appeared to be absent. In November 2005, we observed a male feeding at a flowering *Inga* sp. tree at Isla Riberalta, in dpto. Pando. This tree was also visited repeatedly by a pair of Black-throated Mango *Anthracothorax nigricollis* and a single Sapphire-spangled Emerald *Amazilia lactea.* This Amazonian river island is otherwise almost entirely covered with *Cecropia* woodland and flanked on both sides of the river by tall forest, and is thus a rather unusual locality for the species.

Previous records of Ruby-topaz Hummingbird in Bolivia are undocumented and—one might argue—unreliable. Augusto Ruschi reported sight observations from San Matías in eastern dpto. Santa Cruz (Ruschi 1967), but as he has published notorious misidentifications (Hinkelmann 1988) and is now known to have 'falsified a considerable part of [his] research' (Willis 2003), this record is best discarded. Since then, the species has been reported from Noel Kempff Mercado National Park, dpto. Santa Cruz, in 1991 (Killeen & Schulenberg 1998), and San Joaquín, dpto. Beni, in 1996 (Mitchell 1997). However, in the first instance the species was listed only provisionally, and in the second the observer was 'extremely unconfident' about the identification. The only other Bolivian record is that from Baures, Beni, undated (F. Sagot *in litt.* to Asociación Armonía), but the original document is no longer traceable. None of these is accompanied by a description, photograph or specimen, and thus our sightings at Guayaramerin are the first documented records for Bolivia. Those at Isla Riberalta are the first for dpto. Pando. The appearance of the species here, in unusual habitat, along with the fluctuating seasonal abundance at Guayaramerin, points to some form of migration or movement within or through Bolivia. This tallies with the fact that *Chrysolampis* is one of the most migratory hummingbirds in the Neotropics (Sick 1993, Schuchmann 1999).

WIRE-CRESTED THORNTAIL *Discosura popelairii*

A female, observed feeding for several minutes, was photographed at Candelaria, near Alto Madidi, in December 2001. Given the low altitude, we initially assumed that we were dealing with either Black-bellied Thorntail *D. langsdorffi*, for which a single documented Bolivian record exists (from Camino Mucden, near Cobija, dpto. Pando: Parker & Remsen 1987), or Coppery Thorntail *D. letitiae*, a mysterious taxon known from three 19th-century specimens, probably collected in Bolivia. Having paid special attention to mantle colour, confirming this was bright green, unlike *letitiae,* we concluded that we had found Black-bellied Thorntail. However, subsequent research and experience led us to re-identify the Candelaria bird as Wire-crested Thorntail, which we had previously eliminated on account of its geographical and altitudinal distribution. In plumage, the extensive deep-black underparts contrasting sharply with the large, broad-based white moustachial are typical of female *popelairii*, but not *langsdorffi.* The upperparts were uniform green, abutting the white rump band, which was clearly bordered below by black, thus differing from female *langsdorffi*, and the tail was not as long or bifurcated as that

of female *langsdorffi*. Candelaria lies at 400 m, near the foot of an outlying Andean ridge, the 1,000-m Serranía del Tigre, and thus resembles sites on the upper río Madre de Dios, Peru (e.g. Amazonia Lodge and Pantiacolla Lodge), where *popelairii* far outnumbers *langsdorffi*.

This record is the first for Bolivia, but is not the southernmost ever. Until recently, the nearest known locality was Hacienda Cadena, in the Marcapata Valley (Berlepsch & Stolzmann 1906), which is *c.*180 km to the west. There have been two recent observations (21 and 23 January 2006) further south of adult males, in shade-coffee plantations at Palmerani (1,100 m, 14°03'S, 68°54'W), prov. Sandia, dpto. Puno, Peru, within 2 km of the border with Bolivia (V. H. García-Soliz *per* S. K. Herzog *in litt.* 2006). These new data suggest that the status of Black-bellied Thorntail in Bolivia needs re-evaluating; in particular, we would argue that no conclusive record exists for dpto. La Paz or Madidi National Park, for which it is listed by Hennessey *et al.* (2003b). This listing now rests on a provisional report of a male observed near the río Yariape (14°12'S, 67°58'W), in November 1996 (Ohlson 1996). The observers were uncertain of the identification and the accompanying description does not eliminate other thorntails. Moreover, the locality is at 600 m and the record thus probably involved *D. popelairii*. On the basis of nearby records, Remsen & Parker (1995) speculated that Black-bellied Thorntail, and perhaps Coppery Thorntail, would be found in Madidi National Park, but made no mention of Wire-crested Thorntail.

GREEN-TAILED GOLDENTHROAT *Polytmus theresiae*

Though this hummingbird does not appear on a recent list of Bolivian birds (Hennessey *et al.* 2003b), two undocumented records have since come to light, both from the Puerto Moscoso area, adjacent to the río Heath, in dpto. La Paz. Independent sightings in pampas near the south bank of the río Heath in February 1995 (T. Valqui *in litt.* 2005) and June 1997 (B. Walker *in litt.* 2005) went unpublished, mainly because the species had already been collected nearby in southern Peru, in the Pampas del Heath sector of Bahuaja-Sonene National Park (Montambault 2002). Retrospectively, the species can be added to the list for Madidi National Park, on which it was included as a likely candidate (Remsen & Parker 1995).

Given that all other open-country species found at the Pampas del Heath are more widespread in Bolivia than Peru, the distribution of *P. theresiae* suggests that it may have been overlooked across a wider area. These suspicions were borne out when the species was found to be the most abundant hummingbird in shrubland and stunted forest at Guayaramerin (site B), dpto. Beni, on 22–25 April 2005. Of eight birds trapped in mist-nets, five were caught in dense shrubland with an uneven canopy of 1–6 m and three in the shaded understorey of stunted forest with a canopy at 10 m. They seemed to avoid open grassland favoured by White-tailed Goldenthroat *P. guainumbi*. Both sexes were photographed and sound-recorded;

nearby, at Guayaramerin (site A) others were sound-recorded on 26 April and 15 October 2005.

BLUE-CHEEKED JACAMAR *Galbula cyanicollis*
We found this species on four occasions at Los Indios, dpto. Pando, October 2005, including one trapped and photographed. Following records from the lower río Negro (Montambault 2002), Piedritas and Campamento Caimán (Moskovits *et al.* 2003), our locality is the fourth for Bolivia and confirms that the species occurs across eastern Pando, south to the north shore of the río Beni; it should be looked for on the south bank in suitable habitat. Both Blue-cheeked and Yellow-billed Jacamars *G. albirostris* are listed for Bolivia by Hennessey *et al.* (2003b), the latter in error.

BRONZY JACAMAR *Galbula leucogastra*
An adult was seen at Riberalta (km 27E), perched *c.*18 m above ground in the subcanopy of selectively logged forest, in October 2003. It loosely associated with a mixed-species flock of canopy insectivores, including Paradise Jacamar *G. dea.* Subsequently, in April 2005, another adult was observed at Guayaramerin (site B), foraging *c.*12 m up in the canopy of low-stature forest. Both were easily identified by their very dark plumage, with contrasting white throats and rear underparts. These are the first records for dpto. Beni. In May 2005, a pair was also sound-recorded and photographed at Los Indios, in southern dpto. Pando, 1 km from the río Beni, and birds were regularly heard here in October 2005. Until this series of records, Bronzy Jacamar was known only from northern dpto. Pando, with records from the Cobija area (Parker & Remsen 1987) and Federico Román (Moskovits *et al.* 2002). At Manoa and Piedritas it is a rather common and conspicuous inhabitant of stunted forest and *Scleria* forest.

BROWN-BANDED PUFFBIRD *Notharchus ordii*
Rare in collections and always considered 'very difficult to detect' (Parker & Remsen 1987), but the species is quite vocal and much more obvious now that the distinctive song is known (see Zimmer *et al.* 1997, Alonso & Whitney 2003). Indeed, familiarity with its voice has resulted in its discovery at many new localities throughout Amazonia in recent years. In Bolivia, the only two previous records are both from dpto. Pando, the first at Camino Mucden, near Cobija (Parker & Remsen 1987) and the other at Campamento Caimán, 15 km south of Nueva Esperanza, at 10°13'S, 65°22'W (Moskovits *et al.* 2003). We added four new localities, all in dpto. Pando: Manoa (three encounters), Dos de Junio (one), Piedritas (five) and Los Indios (eight). At each, birds were heard in the upper levels of stunted forest, in adjacent *várzea,* or in the canopy of tall selectively logged forest. Only once were birds seen, but we documented its presence at Manoa and Los Indios with sound-recordings. The latter record extends the known range to the north bank of the río Beni, and, given that the species is often found alongside Bronzy Jacamar *Galbula leucogastra,* it seems plausible that the range also extends into dpto. Beni.

CHESTNUT-CAPPED PUFFBIRD *Bucco macrodactylus*
A single was seen at Candelaria, near Alto Madidi, in December 2001. The species is known from the Tambopata and río Heath regions, Madre de Dios/Puno, southern Peru (Foster *et al.* 1994), and is generally fairly common in dptos. Pando and Beni, Bolivia, particularly in secondary forest and at the shrubby edges of clearings (pers. obs.). This record follows two unpublished records in dpto. La Paz, one at Chalalan Lodge in September 1996 (P. Burke *per* S. K. Herzog *in litt.* 2006) and another at the río San Antonio in August 1997 (S. K. Herzog *in litt.* 2006). Chalalan and Candelaria are within Madidi National Park, where the species was predicted to occur by Remsen & Parker (1995).

COLLARED PUFFBIRD *Bucco capensis*
A single was photographed in stunted forest at Piedritas, in November 2005. This is the second documented record for Bolivia, the first having been recently found at Campamento Caimán, *c.*35 km to the south (Moskovits *et al.* 2003). The species is difficult to detect unless the song is known, and it probably occurs thinly across lowlands of dptos. La Paz and Pando.

STRIOLATED PUFFBIRD *Nystalus striolatus*
A single was heard above Coroico, on 22 November 2005. It approached a whistled imitation of its song, permitting photography. Because of a slight morphological and behavioural resemblance to pygmy-owls *Glaucidium,* the species tends to be mobbed more than most puffbirds. In this case, the bird was being buzzed by the hummingbirds *Phaethornis superciliosus*, *Chlorostilbon mellisugus* and *Amazilia chionogaster* as it perched in a tall *Eucalyptus.* At 1,850 m, this locality is higher than the upper elevational limit of 1,500 m previously reported for Bolivia (Hennessey *et al.* 2003b), and indeed is the highest on record. It has been found to 1,700 m in Ecuador, where essentially a foothill bird (Ridgely & Greenfield 2001), but in Bolivia is more commonly found in lowland Amazonia.

CINNAMON-THROATED WOODCREEPER *Dendrexetastes rufigula*
At least one was seen daily and sound-recorded at 1,050 m in humid forest near Illampu, in April 2005. The previous upper elevational limit in Bolivia was 800 m (Hennessey *et al.* 2003a). This tallies with the situation in Peru and Ecuador, where it is usually found below 500 m, sometimes to 950 m, and only once at 1,200 m (Ridgely & Greenfield 2001, Marantz *et al.* 2003).

OCELLATED WOODCREEPER *Xiphorhynchus ocellatus*
This species was fairly common in *Scleria* forest and streamside *várzea* at Manoa, dpto. Pando, in May 2005. On the basis of our sound-recordings, B. M. Whitney (*in litt.* 2006) identified the race involved as *perplexus*. The Andean foothill and west Amazonian forms of the Ocellated Woodcreeper complex (*napensis*, *chunchotambo*, *brevirostris*) are now often treated as a separate species, Tschudi's Woodcreeper *X. chunchotambo* (Aleixo 2002, Marantz *et al.* 2003). If this

arrangement is accepted—and there appears to be ample justification on vocal grounds—our record confirms the occurrence of 'true' Ocellated Woodcreeper in Bolivia, which we documented with photographs of two mist-netted individuals (Fig. 3).

The expanded species, including the *X. chunchotambo* group, is listed for dpto. Pando by Hennessey *et al.* (2003b), based on an undocumented sighting in 2000 near Chive, on the río Madre de Dios (listed in an unpublished report on the Reserva Nacional de Vida Silvestre Amazónica Manuripi, by R. Miserendino). The racial identity was not specified, but it seems certain that the record would pertain to *X. chunchotambo*, given that this form has been recorded east of the Andes in the Amazonian lowlands of Peru as far as Balta, near the Brazilian border, and the Reserva Amazónica lodge, also on the río Madre de Dios, close to the Pando border (D. F. Lane *in litt.* 2006, T. S. Schulenberg *in litt.* 2006). Given the difficulty of separating *Xiphorhynchus* in the field, further confirmation of *X. chunchotambo* in dpto. Pando is desirable, but it seems likely that both Tschudi's and Ocellated Woodcreepers occur in the region, perhaps in close proximity. Incidentally, Hennessey *et al.* (2003b) listed one other race of *X. ocellatus* for Bolivia in error: *bangsi* is a form of a different highland species, the Olive-backed Woodcreeper *X. triangularis.*

Given current knowledge, *X. o. perplexus* appears to be a scarce and patchily distributed taxon. In Peru it occurs in the northern lowlands, in the watersheds of the río Napo and río Javari, south of which it is apparently absent (D. F. Lane *in litt.* 2006, partly on the basis of information supplied by B. M. Whitney). In Brazil *perplexus* occurs from western Amazonas east at least to the rio Tefé, and south to Acre (Marantz *et al.* 2003), but there are few recent records (A. Whittaker *in litt.* 2005). The voice of *X. o. perplexus* differs significantly from forms east of the rio Madeira (e.g., *X. o. ocellatus*), and a case can be made for further subdividing the Ocellated Woodcreeper complex. A review of vocal, morphological and genetic data is underway (B. M. Whitney *in litt.* 2006).

CHESTNUT-THROATED SPINETAIL *Synallaxis cherriei*

One, presumably of the race *saturata,* was tape-recorded and photographed at Extrema, dpto. Pando, on 7 November 2004, representing the first documented record for Bolivia (Fig. 4). This bird, the only one found during an intensive three-day search, was difficult to observe, but easily lured into a mist-net using playback. It was holding territory in a highly disturbed area of forest with few tall trees, abundant *Guadua* cf. *weberbaueri* bamboo and patches of dense low shrubbery. Surveys of forest mixed with bamboo *c.*30 km distant at San Sebastián (11°24'S, 69°01'W) and other localities downstream on the río Tahuamanu, failed to find the species (Alverson *et al.* 2000), as did earlier surveys near Cobija, Pando (Parker & Remsen 1987). This suggests that its distribution in Bolivia is inexplicably patchy, much as elsewhere in its range. The closest documented localities of *saturata* are from the río Madre de Dios, Peru, where specimens (in Yale Peabody Museum)

were collected at Altamira by C. Kalinowski in 1962 (T. S. Schulenberg *in litt.* 2005), and Cocha Cashu, Manu National Park, where a bird was sound-recorded (at 11°50'S, 70°23'W) in July 2004 (D. J. Lebbin *in litt.* 2005). Further afield, *saturata* and the closely related *napoensis* are known from scattered localities in the Apurímac and Urubamba valleys, Peru, and in northern Peru, Ecuador and Colombia (Collar *et al.* 1992).

The relationship with *Guadua* merits comment. No association with bamboo has previously been noted in Colombia, Ecuador or most of Peru, where the favoured habitat is the understorey of humid second growth, and occasionally tall humid forest (Collar *et al.* 1992). In contrast, at Alta Floresta, Mato Grosso, Brazil, the nominate race inhabits 'larger, more mature and homogenous stands of bamboo within the forest interior' (Zimmer *et al.* 1997; pers. obs.). Elsewhere, the only record from Cocha Cashu, Madre de Dios, Peru (of *saturata*), involved a bird whose territory was restricted to a patch of degraded bamboo tentatively identified as *G. sarcocarpa purpuracea* (D. J. Lebbin *in litt.* 2005). As at Extrema, the bamboo at Cocha Cashu was a broad-stemmed variety but the canopy was low (*c.*4 m at most, often less) because the absence of stabilising trees had caused mature bamboos to collapse (D. J. Lebbin *in litt.* 2005). In conclusion, Chestnut-throated Spinetail is absent from most large areas of bamboo in dpto. Madre de Dios, Peru, and dpto. Pando, Bolivia, but present at some *Guadua*-dominated sites where the bamboo canopy is low.

PARKER'S SPINETAIL *Cranioleuca vulpecula*

The only record of this river-island species in Bolivia is from Victoria, on the north bank of the río Beni, where collected in 1937 (Gyldenstolpe 1945). We found it *c.*10 km away at Boca Madre de Dios, in May 2005, and further upstream on the río Madre de Dios at Isla Valparaiso, where two birds were attending a nest in October 2003. Downstream on the río Beni, the species was present at Isla Boca Orthon and Isla Riberalta in November 2005, but apparently absent from several other islands near Cachuela Esperanza and the Falls of the Madeira. These records, the second to fifth for Bolivia and the first for dpto. Beni, are all documented by photographs and/or sound-recordings.

MOUSE-COLOURED ANTSHRIKE *Thamnophilus murinus*

Known in Bolivia by one published record from the lower río Negro, dpto. Pando, at the border with Brazil (Montambault 2002), and a sound-recording from Arroyo Tulupa (12°12'S 68°22'W), also in dpto. Pando, by Omar Rocha (Mayer 2000), we found it fairly common (2–4 encounters daily) at Abuna, Manoa, Dos de Junio and Piedritas, where Plain-winged Antshrike *T. schistaceus* appears absent (the opposite scenario was reported by Moskovits *et al.* (2003). Surprisingly, we found both species on the north bank of the río Beni at Los Indios, Pando, within sight of dpto. Beni. Diagnostic tape-recordings were obtained at three localities (not Dos de Junio), and a male was photographed at Manoa. These records, the third to seventh for Bolivia, suggest that *T. murinus* is the common form of this species-pair in

north-east dpto. Pando, where it probably replaces *T. schistaceus*, at least locally. Given the preponderance of poorly drained or seasonally flooded forests in this remote area, we might conclude that *murinus* favours this habitat where its range meets that of *schistaceus*. However, the opposite appears to hold true elsewhere (Zimmer & Isler 2003). To add a further layer of complexity to an already confusing issue, these forms were syntopic and roughly equally abundant at Los Indios, both accompanying mixed-species flocks at mid levels in *terra firme*. They were heard counter-calling on several occasions, but we never found a flock containing both species, suggesting inter-specific territoriality.

SPOT-WINGED ANTBIRD *Percnostola leucostigma*

Several were found at Los Indios, dpto. Pando, in May and October 2005. Like most members of the *P. leucostigma* complex they foraged near the ground, in the vicinity of water, in this case small streams in selectively logged forest. Judging by its distinctive song (tape-recorded), the form involved was *P. l. humaythae*, which possibly represents a separate species from *P. l. brunneiceps*, a form inhabiting the lower Andean foothills in Bolivia (Zimmer & Isler 2003). Previous Bolivian records of *P. l. humaythae* are from Camino Mucden (Parker & Remsen 1987), Piedritas and Campamento Caimán (Moskovits *et al.* 2003), all in dpto. Pando, but the Los Indios record is the first as far south as the río Beni.

Intriguingly, two recent unpublished records of 'Spot-winged Antbird' are from much further south, in Noel Kempff Mercado National Park (L. Navarrete *in litt.* 2005). If this population is also *P. l. humaythae*, it represents a southward extension of several hundred km though dpto. Beni to eastern dpto. Santa Cruz. It seems equally likely, given the tendency for south Brazilian forms to cross the río Iténez into Noel Kempff Mercado National Park (Killeen & Schulenberg 1998), that these might be *P. l. rufifacies*, a form otherwise known only east of the rio Madeira. Though morphologically similar, its song is distinctive and it probably represents a species-level taxon (B. M. Whitney *in litt.* 2006). Further surveys are required.

BROWNISH ELAENIA *Elaenia pelzelni*

The first and only record of this riverine species in Bolivia involved a small series collected by A. M. Olalla *et al.*, at Victoria on the north bank of the río Beni, dpto. Pando, in 1937 (Gyldenstolpe 1945). We found it fairly common on Isla Valparaiso and in *Cecropia*-dominated regrowth along adjacent banks of the río Madre de Dios, in October 2003. This appears to be the second record for Bolivia, the first for 66 years, and the first for the río Madre de Dios itself. We also report the third Bolivian locality, from further downstream on the río Beni, at Isla Riberalta, in November 2005, representing the first record for dpto. Beni. Several were seen and heard at this site, in the midstorey and edge of extensive *Cecropia*-woodland. In both cases, birds were sound-recorded and photographed. The species is apparently absent from islands further downstream around Cachuela Esperanza and the Falls of the Madeira.

PLAIN-CRESTED ELAENIA *Elaenia cristata*
Encountered near the turn-off to San Lorenzo de Pampa, in October 2003 and November 2005, and then found further east in *cerrado*-type habitat at the edge of low-stature forest near Guayaramerin (sites A and B), in April 2005. It was scarce at San Lorenzo de Pampa, where usually outnumbered by Yellow-bellied Elaenia *E. flavogaster* and Lesser Elaenia *E. chiriquensis*. At Guayaramerin, in contrast, it was common and the only breeding *Elaenia* present (*parvirostris* and *spectabilis* occur as austral migrants): we found three active nests and saw over 20 birds. First discovered in Bolivia in 1989, when thought likely to be an austral migrant (Bates *et al.* 1992), Plain-crested Elaenia is currently listed from dptos. La Paz and Santa Cruz (Hennessey *et al.* 2003b). We documented these first records for dpto. Beni with sound-recordings and photographs (field, hand, nest and eggs). Its abundance in the region of Noel Kempff Mercado National Park and Guayaramerin suggests that the species is probably widespread in grassland and *cerrado* regions of Bolivia.

ZIMMER'S TODY-TYRANT *Hemitriccus minimus*
Only known from three published localities in Bolivia: other than Noel Kempff Mercado National Park, dpto. Santa Cruz, where discovered near Los Fierros and on the Serranía de Huanchaca in 1989 (Bates *et al.* 1992), the only record is from Versalles (13°00'S, 62°50'W), dpto. Beni, near the río Iténez (Parker *et al.* 1991). A record from 1994 at Estancia El Refugio, near Noel Kempff Mercado National Park (Killeen & Schulenberg 1998), should be treated as provisional (S. L. Hilty *in litt.* 2005). The species was also found, in 2002, close to dpto. Pando at Taquaras, Rondônia, Brazil (Whittaker 2004).

We heard this species often (several sound-recorded) and saw it twice at Manoa and Piedritas, in April–May 2005, and a few were present in fairly tall selectively logged forest at Los Indios, in October 2005, all in dpto. Pando. We also heard it (one sound-recorded) in low-stature forest at Guayaramerin (sites A and B) in April 2005, and four more were heard (one seen) during a few hours in semi-deciduous *garrabatal* forest near San Marcos in September 2005. These observations represent the first records for dpto. Pando and the first for northern dpto. Beni, and bring the total of Bolivian localities to 11. The species is easily overlooked due to its canopy-dwelling habits and insect-like song, and is probably widespread and fairly common in Bolivia from Noel Kempff Mercado National Park, north to north-east Pando, and west across northern Beni, wherever suitable lower stature forests exist.

WHITE-CHEEKED TODY-TYRANT *Poecilotriccus albifacies*
A pair of this distinctive tyrannid was seen in *Guadua* cf. *weberbaueri* bamboo at Extrema, dpto. Pando, in November 2004. One, presumably a male, was highly responsive to playback, permitting sound-recordings and photographs (Fig. 5). In a three-day search of similar habitat across a wider area, this was the only pair found. It is the first confirmed record in Bolivia; there have been further reports from bamboo along the upper reaches of the río Tambopata, where the river forms the boundary between Bolivia and Peru (E. Barnes *in litt.* 2005), but these lack

documentation or precise locality. In Peru, the closest locality is Oceania, near Iberia, on the upper río Tahuamanu, where it was fairly common in October 2004 (D. J. Lebbin *in litt.* 2004). Oceania is just *c.*20 km from Extrema, and thus a Bolivian record was to be expected. Interestingly, the species was not found during intensive field work at three sites, some with extensive bamboo (*Guadua* sp.), slightly further downstream on the ríos Tahuamanu and Muyumanu in dpto. Pando (Alverson *et al.* 2000). The rarity of *P. albifacies* at Extrema, and its absence from nearby sites, suggests that it ranges only marginally into Bolivia.

SULPHUR-RUMPED FLYCATCHER *Myiobius barbatus*

Encountered on five occasions during ten mornings in the Los Indios area, dpto. Pando, in October 2005. These are the first records of this widespread flycatcher for Bolivia, and photographs and sound-recordings were made. Individuals or pairs were usually found perching openly on branches and vines 1–15 m above ground, making conspicuous sallies after flying insects. In all cases, they formed a component of understorey or midstorey flocks in tall selectively logged humid forest, usually alongside Rufous-rumped Foliage-gleaner *Philydor erythrocercum*, Chestnut-winged Foliage-gleaner *P. erythropterus*, Plain Xenops *Xenops minutus*, Rufous-tailed Xenops *X. milleri*, Slender-billed Xenops *X. tenuirostris*, Cinereous Antshrike *Thamnomanes caesius*, White-flanked Antwren *Myrmotherula axillaris*, Stipple-throated Antwren *M. haematonota*, Grey Antwren *M. menetriesii*, Olivaceous Flatbill *Rhynchocyclus olivaceus*, Yellow-margined Flycatcher *Tolmomyias assimilis*, White-winged Shrike-tanager *Lanio versicolor* and Red-crowned Ant-tanager *Habia rubica.* Once, two individuals were seen chasing, giving a slow series of unobtrusive *tk* notes, sometimes with a feeble downslurred whistle appended; *tk-sew.* These vocalisations are identical to calls of this species elsewhere, including the Atlantic Forest form *mastacalis* (pers. obs.), sometimes treated as a separate species. The only similar species in the humid lowlands is the closely related Black-tailed Flycatcher *Myiobius atricaudus*, which has a paler, more yellowish chest and whiter rump patch. In Amazonia it apparently avoids *terra firme* (Fitzpatrick 2004), where it is inexplicably rare and poorly known (M. Cohn-Haft *in litt.* 2006). Sulphur-rumped Flycatcher occurs in adjacent Peru and Brazil, making occurrence in Bolivia expected. The results of previous surveys suggest that it is absent from large areas of dpto. Pando, but further surveys will probably find it more widespread than current records suggest.

FUSCOUS FLYCATCHER *Cnemotriccus fuscatus*

Two races are listed for Bolivia (Hennessey *et al.* 2003b): widespread *bimaculatus* is a breeder and abundant austral migrant in many areas, and *benianus* supposedly occurs in the hinterland of the río Beni. We found a third race ascribed to Fuscous Flycatcher, *fuscatior*, common on river islands in the Madeira system, where it was perhaps the most conspicuous understorey bird in tangled forests on old rocky islets at the Falls of the Madeira. Several were trapped and photographed in October 2005

and the highly distinctive dawn song was sound-recorded. A single bird—provisionally identified—was seen on Isla Valparaiso, río Madre de Dios, in October 2003, and a few more were positively identified on Isla Riberalta, río Beni, in the denser parts of *Cecropia*-dominated woodland, in November 2005. Our records from dptos. Pando and Beni provide the first confirmation of this resident form in Bolivia. It appears restricted to river-island vegetation, as elsewhere in its range (B. M. Whitney *in litt.* 2006). During the austral winter, *fuscatior* is joined by migrant *bimaculatus*, which also occurs in early successional vegetation along rivers and on river islands in Bolivia, as evidenced by birds trapped and photographed at Boca Madre de Dios, in May 2005. A fourth putative race, *duidae*, was encountered in stunted forest at Piedritas, dpto. Pando. This site had been surveyed in July 2002 by D. F. Stotz *et al.* who concluded that *C. fuscatus* was 'common and perhaps the most characteristic species in this habitat type' (Moskovits *et al.* 2003), but did not specify the race involved. When we visited in May 2005 we only heard the repetitive *chb-chb-chb-chb* calls (not whistled songs) of *C. f. bimaculatus*, and assumed the population to be entirely austral migrants, as reported for sites nearby in Rondônia, Brazil (Stotz *et al.* 1997, Whittaker 2004). When we returned in November 2005, following the departure of most austral migrants, it seemed likely that any remaining *Cnemotriccus* would be *C. f. duidae*, an inhabitant of low-stature forests elsewhere in Amazonia (B. M. Whitney pers. comm. 2003). This proved true: two seen and tape-recorded and one mist-netted and photographed all had characteristics of *duidae*. Moreover, their songs and calls were very similar to vocalisations taped by D. F. Lane and attributed to *duidae* (or a *duidae*-like form) at Iquitos, Jeberos and Cordillera Azul, Peru. Aside of being the first record for dpto. Pando and Bolivia, this locality extends the known range of *C. f. duidae* south by several hundred km.

In terms of morphology, *fuscatior* and *duidae* distinctly differ from each other, and from *bimaculatus* (Zimmer 1938), and the same is true of their ecology and vocalisations. The two Amazonian races are also broadly sympatric, making it clear that they deserve specific recognition. The taxonomy of *C. fuscatus* is a puzzle, however, and its solution requires comprehensive review. This work is underway, with preliminary results indicating that several species-level taxa are involved (B. M. Whitney *in litt.* 2006).

Intriguingly, whilst the occurrence in Bolivia of *bimaculatus*, *fuscatior* and *duidae* is now established, the whereabouts of *benianus* (supposedly a Bolivian endemic) is mysterious. The type series was taken by A. M. Olalla at Victoria, dpto. Pando, on the north bank of the río Beni, 10 km upstream of Riberalta (Gyldenstolpe 1945). We have not examined these specimens (housed in Stockholm, Sweden) but we have recorded only typical *fuscatior* and *bimaculatus* around the type-locality. We suspect that *benianus* is a synonym of *fuscatior*, especially as Olalla's team collected several other river-island birds at Victoria (e.g. *Cranioleuca vulpecula*, *Synallaxis propinqua*, *Elaenia pelzelni*).

HUDSON'S BLACK-TYRANT *Knipolegus hudsoni*
The first record for dpto. Pando of this Near-Threatened species involved at least three female-plumaged birds at Boca Madre de Dios, on 13–14 May 2005. As typical of the species, they were inconspicuous, generally keeping low at the edge of dense cover and rarely perching openly. Two were mist-netted and photographed. Hudson's Black-tyrant is a migrant from breeding grounds in south-central Argentina, and Bolivia is the main wintering ground (Chesser 1997). It is unknown whether the species is a winter resident on this promontory or whether our record involved overshooting migrants, or indeed whether the species reaches further north in Pando (where pampas habitats exist), or even western Brazil. A recent Brazilian record (the first for Rondônia) was from Palafitas Island (09°74'S, 65°13'W) on the río Mamoré, south of Guayaramerin, *c.*100 km east of Boca Madre de Dios (Whittaker 2004).

WHITE-TAILED SHRIKE-TYRANT *Agriornis andicola*
One was observed for over two hours and photographed as it foraged in open *puna* with scattered stone walls near Sajama village, in Sajama National Park, dpto. Oruro. Its common congener, Black-billed Shrike-tyrant *A. montana*, was present in the same area. White-tailed Shrike-tyrant is a Vulnerable species associated with rocky outcrops, stony slopes (often supporting *Puya* bromeliads) and valley floors (Fjeldså & Krabbe 1990). Though reported from *c.*12 Bolivian localities, three in dpto. Oruro (Collar *et al.* 1992, Asociación Armonía database), we mention this observation due to their being only two other observations in Bolivia in the last 30 years: at Azurduy, dpto. Chuquisaca, in 1991 (Fjeldså & Mayer 1996), and Casay Vinto, near the río Cocapata, dpto. Cochabamba, in 1997 (Herzog *et al.* 1997). Our record is also the first from a Bolivian protected area. The species is reported regularly from neighbouring Chile and it seems likely that the cross-border reserve comprising Lauca National Park (Chile) and Sajama National Park (Bolivia) supports an important population.

PALE-BELLIED MOURNER *Rhytipterna immunda*
We found this species in stunted forest at Guayaramerin (site B), in April 2005, documenting our record with photographs and sound-recordings. At least three were heard and occasionally seen in the canopy of low-stature forest and adjoining semi-open shrubland with scattered trees. They reacted strongly to playback of Pale-bellied Mourner vocalisations from Amapá, Brazil, giving apparently identical songs in response. We played the same song at dawn in suitable habitat at Guayaramerin (site A) and at stunted forest near Piedritas without eliciting a response. South of the Amazon this mourner's range is poorly known. It has been recorded at Borba, on the lower rio Madeira, and in southern Mato Grosso (Ridgely & Tudor 1994), and was recently discovered in Rondônia, at Taquaras, only a few km from the Bolivian border (Whittaker 2004). Our record is the first in Bolivia and the first west of the rio Madeira; the species probably occurs more widely in stunted forests of dptos. Beni and Pando.

DUSKY-TAILED FLATBILL *Ramphotrigon fuscicauda*
This inconspicuous species was fairly common by voice in *garrabatal* forest lacking bamboo near San Marcos, in September 2005. During just a few hours in suitable habitat, we heard four give the distinctive *pew-wip* call, and lured one into view with whistled imitations (to which all three *Ramphotrigon* are highly responsive). Surprisingly, although the species is known both to the north and south, this is the first record from dpto. Beni, where it is probably much more widespread than suggested. A short video was taken by J. del Hoyo.

CITRON-BELLIED ATTILA *Attila citriniventris*
During a brief visit to stunted forests near Piedritas in May 2005 we heard a distant song instantly recognisable as an *Attila* but difficult to assign to species. When we returned in November 2005 we heard the song again and used playback of *A. citriniventris* vocalisations from Ecuador to attract the calling bird, thereby obtaining a series of photographs and recordings of two call types. This is the first Bolivian record of this thinly distributed species. It seemed fairly common in palm-rich stunted forest with a canopy at 15–20 m, but absent elsewhere. In Bolivia, this habitat type is perhaps restricted to north-east dpto. Pando. Citron-bellied Attila is known mainly north of the Amazon and at sites relatively close to the south bank of the Amazon, but there are recent Brazilian records from the upper rio Juruá in Acre (A. Whittaker *in litt.* 2005), and east of the rio Madeira in Rondônia, where it was collected 12 km north of Abunã in June 2004 (M. Cohn-Haft *in litt.* 2005). This last is very close to the border with dpto. Pando, making occurrence in Bolivia expected. According to most literature this species inhabits *terra firme* (Ridgely & Tudor 1994, Ridgely & Greenfield 2001, Hilty 2003, Fitzpatrick 2004) and no ecological separation from *A. spadiceus* has been claimed. In dpto. Pando, however, it was absent from tall *terra firme,* where *A. spadiceus* was common, and present only in a transitional habitat between *terra firme* and humid, seasonally inundated stunted forest, where *A. bolivianus* and *A. spadiceus* were apparently absent. It appears that *A. citriniventris* is a characteristic species of this type of transitional forest, and tall *campinarana*, at many sites in the rio Negro and rio Madeira basins, including Rondônia (Cohn-Haft *et al.* 2005). The species thus appears to occupy slightly different habitats in different parts of its range.

PURPLE-THROATED FRUITCROW *Querula purpurata*
A group was seen and tape-recorded at 1,000 m near Illampu, dpto. La Paz, in April 2005. This slightly increases the upper elevational limit for this species in Bolivia from 900 m (Hennessey *et al.* 2003a). Elsewhere, the species reaches 500 m in Venezuela (Hilty 2003), 700 m in Ecuador (Ridgely & Greenfield 2001) and 1,200 m in Colombia (Hilty & Brown 1986).

BLACK MANAKIN *Xenopipo atronitens*
One of the most common and conspicuous species in stunted forest at Guayaramerin (site B), in April and October 2005, with several seen or heard daily; eight were

mist-netted in April and three in October. At Guayaramerin (site A), one was taped (identified by B. M. Whitney) in April 2005 in the understorey of low *cerrado*-edge woodland (10 m canopy), close to seasonally flooded stunted forest (*sartenejal*), but more dense and less humid. Three more were heard in the same area in October 2005. These are the first localities for dpto. Beni, and only the fifth and sixth for Bolivia, though, like Zimmer's Tody-tyrant *Hemitriccus minimus*, it probably occupies most low-stature forests between Noel Kempff Mercado National Park, in eastern dpto. Santa Cruz, where first discovered in 1989 (Bates *et al.* 1992), and Federico Román, in north-east dpto. Pando, where discovered in July 2002 (Moskovits *et al.* 2003).

YUNGAS MANAKIN *Chiroxiphia boliviana*
A female-plumaged bird was trapped and photographed at Cotapata, in December 2005, at 3,200 m. The species is known to ascend to 2,200 m (Snow 2004) and there are reports from 2,600 m (Hennessey *et al.* 2003b). In Bolivia, the species is often common in humid forest at lower altitudes, usually at 1,500–2,000 m, but we have never heard calling males above 2,300 m. This record suggests that non-breeders make significant altitudinal movements, sometimes to elfin forest. As they do not breed or vocalise at this altitude they are difficult to detect except if using mist-nets.

WHITE-BROWED PURPLETUFT *Iodopleura isabellae*
In October 2005 up to three were photographed near Cachuela Esperanza, perching on the uppermost branches of trees in secondary forest edge, 12–25 m above ground. These are the first documented records for dpto. Beni.

CLIFF SWALLOW *Petrochelidon pyrrhonota*
A single of this Nearctic migrant was observed at length at Boca Madre de Dios on 21 October 2003. It foraged over the grassy north shore of the island and perched on driftwood with large numbers of other hirundines, including over 40 migrating Barn Swallows *Hirundo rustica.* On 9 October 2005, a flock of *c.*20 was foraging over the rocky rapids at Cachuela Esperanza, part of which are in dpto. Pando. Again, they flocked with large numbers of foraging hirundines, including residents and migrants. The flock contained, in decreasing order of abundance, Black-collared Swallow *Atticora melanoleuca*, Barn Swallow, Bank Swallow *Riparia riparia*, White-winged Swallow *Tachycineta albiventer*, Blue-and-white Swallow *Pygochelidon cyanoleuca* (presumably of the race *patagonica*) and Brown-chested Martin *Progne tapera.* Though Cliff Swallow had never previously been recorded in dpto. Pando, it was to be expected given that its breeding grounds lie far to the north and its wintering grounds are to the south. Large numbers are present to the south, in the grasslands of dpto. Beni, in November–December (Parker & Rowlett 1984, Tobias 2003), but it is unknown whether these remain in Bolivia throughout the boreal winter or if they move south to the Argentine pampas.

VEERY *Catharus fuscescens*

During six mornings of mist-netting in dpto. Pando we caught five *Catharus*, all of them *fuscescens*, suggesting that it is unusually common here, and Swainson's Thrush *C. ustulatus* relatively scarce, at least in October–November. A single first-winter (i.e. first-basic) individual was mist-netted in lightly logged *terra firme* forest at Los Indios, on 23 October 2005, and four (two adults and two first-winters) were mist-netted in poorly drained stunted forest at Piedritas, on 1–2 November 2005. These five (four of them photographed) are the first in dpto. Pando. Both adults had strongly rufescent upperparts, a feature generally applied to the nominate form, which lacks previous Bolivian records according to Hennessey *et al.* (2003b). Three Bolivian specimens have previously been identified as *salicicola* (e.g., Remsen & Traylor 1983), but all are now thought more likely to be either the nominate or *fuliginosa* (Robbins *et al.* 1999). Racial limits are far from resolved, however, in part because there is so much individual, age-related and seasonal variation within populations (D. F. Lane *in litt.* 2006). As such we refrain from identifying our birds to race.

In general, Swainson's Thrush is a common and widespread Nearctic migrant in Bolivian forests, whereas Veery is rare. There are only six confirmed localities for the country, including Buena Vista, where a specimen was taken in 1945 (Remsen & Ridgely 1980), Concepción (Davis 1992), Santiago de Chiquitos (Remsen & Traylor 1983), Rancho San Julian (Jahn *et al.* 2002) and Santa Cruz city (Asociación Armonía database 2005). The only locality outside dpto. Santa Cruz is Cochabamba, where one was collected in 1937 (Remsen & Traylor 1983). These data imply that Veery is a scarce and irregular transient in Bolivia, but we suggest on the basis of our records that eastern Pando, especially its extensive stunted forests, might support an important population. Moreover, we note that damp, low-stature, Amazonian forest approaches the North American breeding habitat in structure, and we suspect that it provides ideal habitat for migrating or wintering Veery. A predilection for this type of habitat, which is scarce and patchily distributed in the Neotropics, might in part explain the narrow wintering range described for the species (Remsen 2001).

In his analysis of specimen records, Remsen (2001) considered the period 2 December–20 February as that during which Veery is resident on its wintering grounds. By this token, our birds may have been passage migrants, a possibility that accords with the hypothesis that the Neotropical migration of the Veery is elliptical, the southbound route lying west of the northbound (Stotz *et al.* 1992, Remsen 2001). Nonetheless, we feel that the number of birds detected during our brief surveys implies a wintering ground, or at least a major staging ground. The status of the Pando population would be resolved by future field work in midwinter (December–February), using mist-netting, which is easily the most effective method of sampling the population during the non-breeding season.

WHITE-EARED SOLITAIRE *Entomodestes leucotis*
A single of this distinctive species was watched for several minutes foraging in low berry-bearing shrubs 2 km south-west of Pilon, at 800 m. All of the pertinent features were noted, including the conspicuous white flashes on the cheeks and carpal region. Aside from being the second-lowest elevation on record, this is the first report from dpto. Beni. It occurs at low density on adjacent ridges to the west, in dpto. La Paz, making occurrence around Pilon expected (though there are no records from the adjacent Pilón Lajas Biosphere Reserve: Hennessey *et al.* 2003a). The lowest elevation on record is 600 m, at a site on the río Beni, 20 km by river north of Puerto Linares, where a specimen (housed in Louisiana State University Museum of Zoology, Baton Rouge) was collected in 1981 (S. K. Herzog *in litt.* 2006). These occasional low records probably relate to wandering individuals during the dry season.

RED-SHOULDERED TANAGER *Tachyphonus phoenicius*
Found in low-stature forest edge and dense shrubland at Guayaramerin (site B), in April and October 2005, where 2–10 were seen or heard daily, foraging near the ground and bathing in the late afternoon at a series of pools. Pairs or small groups responded aggressively to playback of the only vocalisation heard: a dry chip note, given irregularly and at varying pitch. A female was observed in a patch of shrubby *cerrado* at Guayaramerin (site A), in April 2005, with a few more birds in the edge of stunted woodland in the same area in September 2005. The only previous Bolivian records are from two sites in Noel Kempff Mercado National Park, dpto. Santa Cruz (Bates *et al.* 1992, Killeen & Schulenberg 1998). Our records are thus the first for dpto. Beni, and the third and fourth for Bolivia. They are documented by photographs of a male and female trapped at Guayaramerin (site B).

PEARLY-BREASTED CONEBILL *Conirostrum margaritae*
In June 2002 the known range of this species was extended by *c.*1,050 km along the rio Madeira when it was found breeding on an island in the río Mamoré, near Guayaramerin, dpto. Beni (Whittaker 2004). When we visited Isla Valparaiso, in October 2003, we were unaware of this first record, and thus were surprised to find four Pearly-breasted Conebills, three of them singing. Two of these were in the canopy of a pure stand of *Cecropia* and the third appeared to be holding territory in lower stature scattered *Cecropia* at the north of the island. Our sighting is the second record for Bolivia and the first for dpto. Pando. Given that it is also the first record for the río Madre de Dios, this raises the possibility that the species occurs in *Cecropia*-dominated islands to southernmost Peru (where only known from dpto. Loreto, along the Amazon and Napo). We subsequently found the species scarce at Nueva Esperanza in scattered *Cecropia* along the río Madeira, and very common (far outnumbering Chestnut-vented Conebill *Conirostrum speciosum*) on Isla Riberalta, a *Cecropia*-rich island in the río Beni, in November 2005. All these records are documented with sound-recordings or photographs. Interestingly, the

only *Conirostrum* present on a large *Cecropia*-dominated island at the Falls of the Madeira (at 10°22'S, 65°23'W, opposite Villa Bella, dpto. Beni) was Chestnut-vented Conebill of the dark form *amazonum*.

LESSON'S SEEDEATER *Sporophila bouvronides*
This species breeds across northern South America from north-east Colombia east to the Guianas (Ridgely & Tudor 1994) and occurs to the south only as a non-breeding migrant. It was first recorded in Bolivia at Montero, dpto. Santa Cruz, in March 1992 (Whitney *et al.* 1994), with few reports since, all from dptos. Santa Cruz and Beni, especially around Trinidad, where it sometimes occurs in large numbers (M. Herrera pers. comm.). The first record for dpto. Pando involved three (one male, two females) in a small patch of rough grassland at Boca Madre de Dios, on 13 May 2005. All three were photographed as they perched on mature *Tessaria* trees. They appeared to be absent next day, suggesting that they were migrants moving north to the breeding grounds.

TAWNY-BELLIED SEEDEATER *Sporophila hypoxantha*
The first record for dpto. Pando involved a male at Boca Madre de Dios, on 21 October 2003. It was present in a large flock of seedeaters, including several Rusty-collared Seedeater *S. collaris* (both sexes) and the next species. Whether these seedeaters spend the non-breeding season on this promontory or were migrants moving south to their breeding grounds is unknown. Central Pando is dotted with isolated pampas vegetation and it seems inevitable that migrant seedeaters use these habitats, even though the only relevant field survey failed to encounter a single species of *Sporophila* (Alverson 2003). Regardless of the availability of pampas habitat, deforestation in dpto. Madre de Dios, Peru, is causing populations of several *Sporophila* to increase and expand north, at least seasonally (D. F. Lane *in litt.* 2005), and a similar process in Pando will doubtless lead to further records from the region.

DARK-THROATED SEEDEATER *Sporophila ruficollis*
The first record for dpto. Pando involved three males flocking with the previous species at Boca Madre de Dios, on 21 October 2003. It was unclear how many females were present: female Rusty-collared Seedeaters were easily identified, but smaller nondescript females were difficult to distinguish and may have been *S. hypoxantha*, *S. ruficollis* or both. The comments under Tawny-bellied Seedeater also apply here.

YELLOW-SHOULDERED GROSBEAK *Parkerthraustes humeralis*
One was seen at Illampu, on an outlying ridge of the Andes, dpto. La Paz, in April 2005. We were unable to document the sighting with a photograph, and did not record its voice (a series of tanager-like *tsip* notes), but the species is sufficiently distinctive to include the record here. The large size, heavy-based bill, dark ear-

coverts, yellow flash at the carpal and obvious yellow undertail-coverts, contrasting with whitish underparts, were all clearly noted, as was the typical sluggish behaviour of the species as it accompanied a mixed-species flock in the mid canopy. This sighting raises its upper elevational limit in Bolivia from 800 m (Hennessey *et al.* 2003b) to 1,350 m. Indeed, this appears to be the highest locality on record, as it is known only to 900 m, and mainly below 600 m, in Ecuador (Ridgely & Greenfield 2001), and to 900 m in Peru (Clements & Shany 2001).

CERULEAN WARBLER *Dendroica cerulea*

A male was photographed in the canopy of humid montane forest at 1,500 m, near Tunquini Research Station, dpto. La Paz, on 7 February 2005. It was watched for 15 minutes as it accompanied a large mixed-species flock of frugivores and insectivores, including Olive-backed Woodcreeper *Xiphorhynchus triangularis*, Olivaceous Woodcreeper *Sittasomus griseicapillus*, Streaked Xenops *Xenops rutilans*, Slaty-capped Flycatcher *Leptopogon superciliaris*, Sclater's Tyrannulet *Phyllomyias sclateri*, Mottle-cheeked Tyrannulet *Phylloscartes ventralis*, Golden Tanager *Tangara arthus*, Blue-browed Tanager *T. cyanotis*, Capped Conebill *Conirostrum albifrons*, Deep-blue Flowerpiercer *Diglossa glauca* and Slate-throated Redstart *Myioborus miniatus*. By composition, this might be considered a mid-elevation flock as species such as *P. sclateri*, *D. glauca* and *T. cyanotis* tend to be absent above 1,800 m in this region (pers. obs.). There are three previous documented Bolivian records, including two 19th-century records from Nairapi and Tilotilo (highest probably around 1,300 m), dpto. La Paz (Sclater & Salvin 1879, Bond & Meyer de Schauensee 1942), and another from Puerto Salinas (300 m), dpto. Beni, in December 1937 (Gyldenstolpe 1945), on the basis of which the species is listed by Pearson (1980). The Tunquini record is the fourth for Bolivia and the first in 66 years, the third record for dpto. La Paz, and possibly the highest record in Bolivia. It fits a pattern established in Ecuador and Peru, where singles are usually found in mixed-species flocks in the Andean foothills; most Ecuadorian records come from elevations between 500 and 1,400 m, with scattered records—probably of transients—from the Amazonian lowlands to 2,000 m (Ridgely & Greenfield 2001).

In North America, the breeding population has been declining for several decades (Robbins *et al.* 1998), leading to its classification as Vulnerable (IUCN Red List 2005) and raising suspicions that the species may no longer reach Bolivia in winter (A. B. Hennessey *in litt.* 2005). It is possible, however, that a declining migrant would continue to populate its entire historical non-breeding distribution, just more thinly, a hypothesis tentatively supported by our record. Cerulean Warbler may still occur regularly in Bolivia and any conservation programme should take into account the possibility that a small but significant population occurs seasonally in foothill forests of the northern Yungas.

GREEN OROPENDOLA *Psarocolius viridis*

Two were heard at Piedritas, one in the canopy of tall *terra firme* and the other in the 15-m canopy of stunted forest, in November 2005. The former was seen well in response to playback and documented by sound-recordings. The only previous Bolivian record was by Ted Parker, along the lower reaches of the río Negro, near the border with Acre, Brazil (Montambault 2002). The paucity of Bolivian records, despite increasing surveys, suggests that the species occurs only marginally in eastern dpto. Pando, where far outnumbered by Olive Oropendola *P. bifasciatus* and Crested Oropendola *P. decumanus*.

Acknowledgements

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CORRIGENDUM

In a recent paper on bird records from Minas Gerais, Brazil (Vasconcelos *et al.*, 2006, *Bull. Brit. Orn. Cl.* 126: 212–238), it was stated that a sight report of Sand Martin *Riparia riparia*, in March 2006, appeared to be the first published record for the state, but the authors inadvertently overlooked a record of their own (Kirwan *et al.*, 2001, *Ararajuba* 9: 145–161), at Pirapora in December 1999.—THE EDITOR.

INSTRUCTIONS FOR AUTHORS

Authors are invited to submit papers on topics relating to the broad themes of taxonomy and distribution of birds. Descriptions of new species of birds are especially welcome and will be given priority to ensure rapid publication, and may be accompanied by colour photographs or paintings.

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Numerals—thousands separated by commas, e.g. 1,000, 12,000

Units of measurement, SI. Space between values and unit, e.g. 12.1 g

Statistical tests in the form: ($r_{28} = 3.12$, $P < 0.01$). ($\chi^2_3 = 7.31$, n.s.)

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